Davy

# A MODERN SYSTEM OF NATURAL HISTORY.

CONTAINING

Accurate Deſcriptions, and faithful Hiſtories,

OF

ANIMALS, VEGETABLES, and MINERALS.

Together with

Their Properties, and various Uſes in MEDICINE, MECHANICS, MANUFACTURES, &c.

Illuſtrated

With a great Variety of COPPER-PLATES, accurately drawn from Nature, and beautifully engraved.

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By the Rev. SAMUEL WARD, Vicar of Cotterſtock, cum Glapthorne, Northamptonſhire; and others.

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VOL. XI.

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*The great Creator did not beſtow ſo much Curioſity and Workmanſhip upon his Creatures to be looked upon with a careleſs incurious Eye.*

Derham's Phyſ. Theol. Book xi.

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LONDON:

Printed for F. NEWBERY, the Corner of St. Paul's Church-yard, Ludgate-ſtreet. 1776.

BRITISH MUSEUM

# THE NATURAL HISTORY OF REPTILES AND INSECTS.

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Bull Frog
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THE

# NATURAL HISTORY

OF

# REPTILES and INSECTS.

## THE FROG.

THE frog is an animal too well known to require any deſcription; but ſome of its properties are too ſingular to be paſſed by unnoticed. Compared to the bulk of its body, its leap or ſpring is remarkably great; and it is the beſt ſwimmer of all four-footed animals. For theſe purpoſes nature has finely adapted the parts of this animal; the arms being light and active, the legs and thighs long, and furniſhed with very ſtrong muſcles. Though it may appear ſuperfluous to deſcribe the form of animals ſo well known as the frog and toad, it may be neceſſary to mark thoſe differences which diſtinguiſh them from

each other. The frog moves by leaping; the toad crawls along the ground: the frog is in general ſmaller than the toad; it has a brighter colour, and a more poliſhed ſurface: the toad is brown, rough, and duſky. The frog is light and nimble, and its belly is ſmall in proportion to the ſize of the animal; the toad is ſlow, corpulent, and heavy. Their internal parts are nearly the ſame, except that the lungs of the toad are more compact than thoſe of the frog. Neither has the toad ſo many air-bladders as the frog; conſequently it is leſs fitted for living under water.

The frog has a very little brain for its ſize; it has a very wide ſwallow; the ſtomach is apparently ſmall, but capable of great diſtention. The heart, like that of all other truly amphibious animals, has but one ventricle; the blood therefore can circulate while it keeps under water, without the aſſiſtance of the lungs. The lungs reſemble a number of ſmall bladders joined together, like the cells of a honey-comb: they are connected to the back by muſcles, and the animal can diſtend or exhauſt them at pleaſure. Theſe are the moſt ſtriking peculiarities in the anatomy of a frog; in

in which it agrees with the toad, the lizard, and the ſerpent.

The egg which produces a tadpole, is ſmall, black, and globular, and is ſurrounded with two different kinds of liquor: that which immediately ſurrounds it, is clear and tranſparent, and contained in its proper membrane; that which ſurrounds the whole is muddy and mucous: the tadpole receives its nouriſhment from the tranſparent liquor, in the ſame manner as young birds are ſupported by the white of the egg. When this membrane is broken, the tadpole adheres with its mouth to part of it for ſome time; and as ſoon as it gets free, ſinks to the bottom of the water; whence it never riſes while it continues in its tadpole ſtate.

When they are releaſed from their tadpole ſtate, they immediately take to land; and, if the weather has been hot, and ſome ſhowers fall to refreſh the earth, the ground is ſometimes ſeen, for a conſiderable ſpace, perfectly blackened by myriads of theſe animalcules, ſeeking for ſome ſecure lurking places. Hence ſome * have imagined that theſe animals were generated in the clouds, and thus ſhow-

* Rondaletius, 216—Wormii Muſ. 327.

ered

ered down on the earth. But had they, like our countryman Derham, traced them to the next pool, they would have found a better ſolution of the difficulty.

The frog is longer out of the water than in it; but when the cold nights begin to ſet in, it returns to its native element; always chooſing ſtagnant waters, where it can lie concealed at the bottom.

Frogs, as well as all other reptiles, feed but a ſmall ſpace of the year. During winter, frogs and toads remain in a torpid ſtate; the latter of which will dig into the earth and cover themſelves with almoſt as much agility as the mole.

Frogs live upon inſects of all kinds: they continue motionleſs till their prey appears, and when it comes ſufficiently near, they jump forward with great agility, dart out their tongues and ſeize it. In this animal, as well as in the toad, lizard, and ſerpent kinds, the tongue is extremely long, and formed in ſuch a manner that it ſwallows the point down its throat. It therefore draws out a length of tongue, like a ſword from a ſcabbord, to aſſail its prey; and whatever inſect touches its tongue infallibly adheres to it, nature having

having furniſhed it with a glutinous ſubſtance for that purpoſe.

The croaking of frogs is well known, and from thence they are diſtinguiſhed by the ludicrous title of Dutch nightingales and Boſton waites, in the fenny countries. The aquatic frogs of Holland, indeed, are loud beyond conception; and though the animal does not exceed a man's fiſt in magnitude, it ſends forth a note that may be heard at the diſtance of three miles *. The large water frogs have a note as loud as the bellowing of an ox, and when they exert it, they puff up their cheeks to an amazing ſize.

Of all frogs, however, the male only croaks: before wet weather their voices are in full exertion; they are then heard, with unceaſing aſſiduity, ſending forth their call, and welcoming the approaches of their favourite moiſture. Mr. Pennant † informs us, that "There is a time of "the year when they become mute, "neither croaking nor opening their "mouths for a whole month: this hap-"pens in the hot ſeaſon, and that is in "many places known to the country "people by the name of the Paddock-"moon."

* Ræſal. † Brit. Zoology, vol. III. p. 4.

The

The male frog is uſually of a greyiſh brown colour; the female is more inclining to yellow, ſpeckled with brown.

When a frog is ninety-two days old, two ſmall feet are ſeen towards the tail, and the head appears to be ſeparate from the body. The next day, the legs are conſiderably enlarged; and four days after that it refuſes all vegetable food; its mouth appears furniſhed with teeth; and its hinder legs are compleatly formed: the arms are compleatly produced in two days more; and the animal is then entirely perfect, except that it ſtill continues to carry the tail: that however drops off by degrees, and in the ſpace of a few days, no part of it remains.

With its figure, the frog alſo changes its appetites; and, ſo extraordinary is this transformation, that it immediately rejects the food it greedily fed on a few days before: it would even ſtarve if no other could be procured. When the animal acquires its perfect ſtate, it becomes carnivorous, living entirely upon worms and inſects, though before that time it fed entirely upon vegetables. Theſe, however, are not to be found in the water; it is therefore obliged to quit its native element, and hunt after food upon

upon land. At firſt it is too feeble to endure the warmth of the ſun, and therefore conceals itſelf among buſhes, and under ſtones; but when the earth is refreſhed by a ſhower, they immediately quit their retreats, in order to enjoy the grateful humidity.

We ſhall conclude our deſcription of the frog, with an obſervation of the great Swammerdam, in his book of nature. "As we ſee inſects loſe many parts with "their old ſkin, this is likewiſe the caſe "in the frog; which, beſides other "things, plainly caſts off its mouth and "tail; ſo that, however admirable the "art, order, conſtruction, and parts of "its members may appear to be; yet "the nerves, arteries, veins, cartilages, "muſcles, and many other remarkable "parts, which gradually vaniſh, and "are, as it were, become inſenſible, "are deſtroyed at once, ceaſe their motions, and ſtop their ſeveral functions, "on the change. Are not theſe changes "admirable? And do not they lay before our eyes the omnipotent hand of "God, conſpicuous in his inacceſſible "radiancy and infinite majeſty? He, in "this caſe, forms another out of one "and the ſame animal, which though

"different

" different in appearance, yet remains " one and the ſame creature. May not " the *reſurrection of the dead be exempli-* " *fied in this illuſtrious inſtance?* all this " is very elegantly manifeſted in various " inſects."

## *The* TOAD.

THE toad, a well known animal; alſo called rubeta, rana rubeta. The toad is of the frog kind, and of the number of thoſe animals which have only one ventricle in the heart. It reſembles the frog, but its belly is more inflated, and ſkin more full of tubercles: it is of an aſh colour, with brown, blackiſh, and yellow ſpots. It does not croak like the frog, but makes an indiſtinct noiſe that is obſcure, and like the word geu, or rather bu, from which ſome ſuppoſe it is called bufo. It is ſaid to have its name rubeta from rubus, becauſe it is often found under bramble-buſhes.

" The toad, ſays Mr. Pennant, is the moſt deformed and hideous of all animals; the body broad, the back flat, and covered with a pimply duſky hide; the belly large, ſwagging, and ſwelling out, the legs ſhort, and its pace labour-

ed

ed and crawling; its retreat gloomy and filthy: in ſhort, its general appearance is ſuch, as to ſtrike one with diſguſt and horror; yet we have been told by thoſe who have reſolution to view it with attention, that its eyes are fine: to this it ſeems that Shakeſpeare alludes, when he makes his Juliet remark,

Some ſay the lark and loathed toad change eyes.

As if they would have been better beſtowed on ſo charming a ſongſter than on this raucous reptile.

But the hideous appearance of the toad is ſuch, as to make this one advantageous feature overlooked, and to have rendered it, in all ages, an object of horror, and the origin of moſt tremendous inventions. Ælian makes its venom ſo potent, that, baſiliſk like, it conveyed death by its very look and breath; but Juvenal is content with making the Roman ladies, who were weary of their huſbands, form a potion from its entrails, in order to get rid of the good man.

*Occurrit Matrona potens, quæ molle Calenum*
*Porrecturа viro miſcet ſitiente rubetam.*

Sat. I. 68.

To quench the huſband's parching thirſt, is
brought
By the great dame, a moſt deceitful draught;
In rich Calenian wine ſhe does infuſe
(To eaſe his pain) the toad's envenom'd
juice.

This opinion begat others of a more dreadful nature; for in after-times ſuperſtition gave it preternatural powers, and made it a principal ingredient in the incantations of nocturnal hags:

Toad that under the cold ſtone,
Days and nights has thirty-one,
Swelter'd venom ſleeping got,
Boil thou firſt i'th' charmed pot.

We know by the poet, that this charm was intended for a deſign of the firſt conſideration, that of raiſing the dead from their repoſe, and bringing before the eyes of Macbeth a hateful ſecond-ſight of the proſperity of Banquo's line.

This ſhews the mighty powers attributed to this animal by the dealers in the magic art; but the powers our poet endues it with, are far ſuperior to thoſe that Geſner aſcribes to it: Shakeſpeare's witches uſed it to diſturb the dead; Geſner's, only to ſtill the living; *Ut vim coeundi, ni fallor, in viris tollerent.*

We may add here another ſuperſtition in

in reſpect to this animal: it was believed by ſome old writers, to have a ſtone in its head, fraught with great virtues, medical and magical: it was diſtinguiſhed by the name of the reptile, and called the toad-ſtone, bufonites, crapaudine, krottenſtein; but all its fancied powers vaniſhed, on the diſcovery of its being nothing but the foſſil tooth of the ſea-wolf, or of ſome flat-toothed fiſh, not unfrequent in our iſland, as well as in ſeveral other countries; but we may well excuſe this tale, ſince Shakeſpeare has extracted from it a ſimile of uncommon beauty:

Sweet are the uſes of adverſity,
Which like the toad, ugly and venomous,
Wears yet a precious jewel in his head.

But theſe fables have been long exploded: we ſhall now return to the notion of its being a poiſonous animal; and deliver, as our opinion, that its exceſſive deformity, joined to the faculty it has of emitting a juice from its pimples, and a duſky liquid from its hind parts, is the foundation of the report.

That it has any noxious qualities, we have been unable to bring proofs in the ſmalleſt degree ſatisfactory, though we

have heard many ſtrange relations on that point.

On the contrary, we know ſeveral of our friends who have taken them in their naked hands, and held them long, without receiving the leaſt injury: it is alſo well known that quacks have eaten them, and have beſides ſqueezed their juices into a glaſs, and drank them with impunity.

We may ſay alſo, that theſe reptiles are a common food to many animals; to buzzards, owls, Norfolk plovers, ducks, and ſnakes, who would not touch them were they in any degree noxious.

So far from having venomous qualities, they have of late been conſidered as if they had beneficent ones. We wiſh, for the benefit of mankind, that we could make a favourable report of the many attempts of late to cure the moſt terrible of diſeaſes, the cancer, by the application of live toads; but alas, they ſeem only to have rendered a horrible complaint more loathſome.

In a word, we may conſider the toad as an animal that has neither good nor harm in it; that being a defenceleſs creature, nature has furniſhed it, inſtead of arms, with a moſt diſguſting deformity, that

that ſtrikes into almoſt every being capable of annoying it, a ſtrong repugnancy to meddle with ſo hideous and threatening an appearance.

The time of their propagation is very early in the ſpring: at that ſeaſon the females are ſeen crawling about oppreſſed by the males, who continue on them for ſome hours, and adhere ſo faſt, as to tear the very ſkin from the parts they ſtick to. We are uncertain whether they are viviparous: Linnæus ſays they are, and diverts us with a report he had heard, that the male acts the midwife to the female in parturition.

To conclude this account with the marvellous, this animal is ſaid to have often been found in the midſt of ſolid rocks, and even in the centre of growing trees, impriſoned in a ſmall hollow, to which there was not the leaſt adit or entrance: how the animal breathed, or how it ſubſiſted (ſuppoſing the poſſibility of its confinement) is paſt our comprehenſion. Plot's ſolution of this phænomenon is far from ſatisfactory; yet as we have the great Bacon's authority for the fact, we do not entirely deny our aſſent to it. *Britiſh Zoology*, vol. iii. p. 7.

There is a very poiſonous ſpecies in America, called cururu by the Braſilians, and capo by the Portugueſe.

The common toad was firſt introduced into medicine upon a cure being performed on an hydropic perſon, to whom powdered toads were given in order to diſpatch him, but he voided a large quantity of urine after taking it, and ſoon recovered of his diſorder. Since this, toads, gently dried and powdered, have been uſed as a diuretic; but the preſent practice is quite unconcerned with them.

In the cure of a cancer, ſays Etmuller, and more particularly unexulcerated cancers in the breaſts of women, toads are of ſingular ſervice, either calcined alone, or dried to ſuch a degree, that they may be reduced to a powder. The method of applying this powder is to ſprinkle it on the part affected. This powder may alſo be mixed with orpiment and ſoot, and applied, when ſpread, upon a pledget moiſtened with Saliva. We are alſo told, that many patients labouring under epidemical dyſenteries have been happily recovered by the uſe of this powder, which operates as a ſudorific. Some preſcribe half a dram of it and upwards in the ſmall-pox. D. Carlius recommends

mends the powder of calcined toads, mixed with the powder of blue linen cloth burnt, in epilepſies of adult perſons attended with an inſpiſſation of the juices; and affirms, that as much of it as may be taken at twice upon the point of a ſmall knife, has in ſome epileptic patients produced the moſt happy and ſurpriſing effects. He alſo informs us, that a doſe from ten to twenty grains of the powder of calcined toads, exhibited internally, wonderfully mitigates arthritic pains, and more eſpecially thoſe with which wounds are attended. Com. Lit. for the year 1733. *p.* 210.

In the ſame work for the year 1735, we have an account of two boys, who towards the latter end of a peſtilential diſorder, in which they had been long afflicted with carbuncles, together with an univerſal anaſarca and dropſy, were cured by a plentiful diureſis excited by the powder of toads, mixed with ſalt of wormwood daily exhibited.

The diaphoretic virtue of this powder, by which it muſt of courſe contribute to the cure of a dropſy, was accidentally diſcovered, as Boecler from Solenander informs us in the following hiſtory. At Rome a certain man had the misfortune

to

to be afflicted with a dropſy, and his wife, thinking much of the expences attending his cure, malicioufly reſolved to poiſon him; for which purpoſe ſhe gave him a doſe of the powder of a toad calcined in an earthen veſſel, by which means a very plentiful diſcharge of urine was occaſioned. But the wife, heartily wearied of ſo uſeleſs and expenſive a huſband, was exceedingly deſirous to put an end to his miſerable life by a ſudden death. With this view ſhe exhibited the ſame powder a ſecond time, by which means the waters were plentifully diſcharged by urine, and the patient cured. Thus her views were diſappointed, and what was intended for a poiſon, happily proved a noble and efficacious medicine.

The following remarkable particulars were communicated in a letter from J. Arſcott, Eſq; of Tabott, in Devonſhire, to Mr. Pennant. "It would give me, "ſays he, the greateſt pleaſure to be a-"ble to inform you of any particulars "concerning the toad who lived for "many years with us, and was ſo great "a favourite. The greateſt curioſity "in it, was its becoming ſo remarkably "tame. It had frequented ſome ſteps "before the hall door, ſome years be-

fore

" fore my acquaintance commenced with
" it, and had been admired by my father
" for its ſize (which was of the largeſt I
" ever met with) who conſtantly paid it
" a viſit every evening. I knew it my-
" ſelf above thirty years, and by conſtant-
" feeding it, brought it to be ſo tame that
" it always came to the candle, and looked
" up as if expecting to be taken up and
" brought upon the table, where I always
" fed it with inſects of all ſorts: it was
" fondeſt of fleſh maggots, which I kept
" in bran; it would follow them, and
" when within a proper diſtance, would
" fix its eye, and remain motionleſs for
" near a quarter of a minute, as if prepar-
" ing for the ſtroke, which was an inſtan-
" taneous throwing its tongue at a great
" diſtance upon the inſect, which ſtuck
" to the tip by a glutinous matter: the
" motion is quicker than the eye can
" follow.

" I always imagined that the root of
" its tongue was placed in the fore part
" of its under jaw, and the tip towards
" its throat, by which the motion muſt
" be a half circle; by which, when its
" tongue recovered its ſituation, the in-
" ſect at the tip would be brought to
" the place of deglutition. I was con-

firmed

" firmed in this by never obſerving any
" internal motion in its mouth, except-
" ing one ſwallow, the inſtant its tongue
" returned. Poſſibly I might be miſ-
" taken, for I never diſſected one, but
" contented myſelf with opening its
" mouth, and ſlightly inſpecting it.

" You may imagine that a toad, ge-
" nerally deteſted (although one of the
" moſt inoffenſive of all animals) ſo
" much taken notice of and befriended,
" excited the curioſity of all comers to
" the houſe, who all deſired to ſee it
" fed; ſo that even ladies ſo far con-
" quered the horrors inſtilled into them
" by nurſes, as to deſire to ſee it. This
" produced innumerable and improbable
" reports, making it as large as the
" crown of a hat, &c. &c. This I
" hope will account for my not giving
" you particulars more worth your no-
" tice. When I firſt read the account
" in the papers of toads ſucking cancer-
" ous breaſts, I did not believe a word
" of it, not thinking it poſſible for them
" to ſuck, having no lips to embrace
" the part, and a tongue ſo oddly form-
" ed; but as the fact is thoroughly ve-
" rified, I moſt impatiently long to be

" fully

" fully informed of all particulars relat-
" ing to it."

Mr. Arſcott, in a ſecond letter to the ſame gentleman, mentions among others, the following additional particulars, in anſwer to ſome queries propoſed by him.

" I cannot ſay how long my father had
" been acquainted with the toad before
" I knew it; but when I firſt was ac-
" quainted with it, he uſed to mention
" it as the old toad I've known ſo
" many years; I can anſwer for thirty-
" ſix years.

" No toads that ever I ſaw appeared
" in the winter ſeaſon. The old toad
" made its appearance as ſoon as the
" warm weather came, and I always
" concluded it retired to ſome dry bank
" to repoſe till the ſpring. When we
" new-laid the ſteps, I had two holes
" made in the third ſtep on each, with
" a hollow of more than a yard long for
" it, in which I imagine it ſlept, as it
" came from thence at its firſt appear-
" ance.

" It was ſeldom provoked: neither
" that toad (nor the multitudes I have
" ſeen tormented with great cruelty)
" ever ſhewed the leaſt deſire of revenge,

" by

" by ſpitting or emitting any juice from
" their pimples.

" A toad has no particular enmity
" for the ſpider.

" I hardly remember any perſons tak-
" ing it up except my father and my-
" ſelf: I do not know whether it had
" any particular attachment to us.

" In reſpect to its end, I anſwer this
" laſt quere. Had it not been for a tame
" raven, I make no doubt but it would
" have been now living; who one day
" ſeeing it at the mouth of its hole,
" pulled it out, and although I reſcued
" it, pulled out one eye, and hurt it
" ſo, that notwithſtanding its living a
" twelvemonth it never enjoyed itſelf
" and had a difficulty of taking its food,
" miſſing the mark for want of its eye.
" Before that accident, it had all the
" appearance of perfect health."

It is ſaid, that cancerous complaints may be cured by a toad. It is, however, certain, great relief has been obtained by that animal's ſucking a cancerous breaſt. The whole of the animal except its head, is put into a linen bag, and the head is held to the part. It generally ſeizes the fouleſt part of the ſore in an inſtant, and ſucks with greedineſs till it

drops off dead. It frequently happens, that the creature ſwells immenſely. Some have lived above a quarter of an hour after ſucking; others much longer. Some have been known to ſuck upwards of four hours, and then dropped dead from the wound, ſwelled exceedingly, and turned of a pale colour. During the time of their ſucking, they are heard to ſmack their lips like a young child.

## THE PIPAL, OR SURINAM TOAD.

THE form of this animal is even more hideous than that of the common toad: the body is flat and broad; the head ſmall; the ſkin of the neck forms a kind of wrinkled collar; the colour of the head is of a dark cheſnut; and the eyes are ſmall: the back is of a lightiſh grey, and ſeems covered with a number of ſmall round eyes, placed at nearly equal diſtances. Theſe eyes are very different from what they ſeem; for they are the animals eggs, covered with their ſhells, and placed there for hatching. Theſe eggs are buried deep in the ſkin, and hardly appear in the beginning of incubation; but they are very viſible when

the young animal is about to burſt from its confinement. Their colour is a yellowiſh red, and the ſpaces between them are full of ſmall warts, reſembling pearls. In all nature, there is not perhaps a more extraordinary phænomenon, than that of an animal breeding and hatching its young in its back; from whence, when arrived at maturity, they crawl out one after the other. This animal, like the reſt of the frog kind, is moſt probably harmleſs; though we are told of terrible effects reſulting from its powder when calcined.

## THE NATTER JACK.

THIS animal neither leaps, nor crawls with the ſlow pace of the toad, but its motion rather reſembles running. The upper part of the body is of a dirty yellow, clouded with brown: it is covered with porous pimples of unequal ſizes. The natter jack, has a yellow line on the back: it has four divided toes on the fore feet, and five on the hind feet a little webbed. It frequents dry and ſandy places.

OF

## OF LIZARDS IN GENERAL.

IT is difficult to ſay to what claſs in nature lizards are chiefly allied. They cannot properly be raiſed to the rank of beaſts, as they bring forth eggs, diſpenſe with breathing, and are not cloathed with hair. They cannot be ranked with fiſhes, as the majority of them live upon land: their feet, upon which they run with great celerity, exclude them from the ſerpent tribe; and they cannot be placed among inſects, on account of their ſize. But, though the lizard is in ſome meaſure excluded from every rank, it exhibits ſomewhat of the properties of all: it has the legs and celerity of the quadruped; the facility of creeping through narrow and intricate ways, like the ſerpent; and the power of living in the water like the fiſh.

Lizards not only differ from every other claſs of animals, but they alſo differ widely from each other: with reſpect to ſize, no claſs of beings has its ranks ſo oppoſite. What can be more removed than the ſmall cameleon of an inch long, and the aligator above twenty-ſeven feet. Their colour is alſo very various:

they are found of a green, blue, red, cheſnut, yellow, ſpotted, ſtreaked, and marbled. If colour alone could conſtitute beauty, the lizard would often pleaſe; but there is ſomething ſo repreſſing in its figure, that the brilliancy of its ſcales, or the variety of its ſpots, cannot make it a deſirable object to behold.

But animals of the lizard kind, are principally diſtinguiſhed by the manner of bringing forth their young. The crocodile, the iguana, and all the larger kinds, bring forth eggs, which are hatched by the heat of the ſun: their produce are complete upon leaving the ſhell; and their firſt efforts are to run to ſeek food in their proper element. The viviparous kinds, in which are all the ſalamanders, are produced alive by the female perfect and active, and ſuffer no ſucceeding change. But thoſe which are bred in the water, ſuffer a very conſiderable change in their form. They are produced with an external ſkin or covering, which ſometimes encloſes their feet and gives them a ſerpentine appearance. Above and below their tail, fins are added to this falſe ſkin, that ſerve the animal for ſwimming; theſe, and the falſe ſkin drop off together; and the lizard has

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Crocodile

Crocodiles Egg

four feet, is completely formed, and forſakes the water.

The three kinds, however, have many points of ſimilitude: they have all four ſhort legs: they have tails which are thick at the beginning, and run tapering to a point: they are all amphibious, and equally capable of living upon land and in the water; and they are all formed internally in the ſame manner as the tortoiſe, and other animals that can continue a long time without reſpiration.

## THE CROCODILE.

THIS animal is placed at a happy diſtance from the inhabitants of Europe. To look for the crocodile in all its natural terrors, grown to an enormous ſize, and committing unceaſing deveſtations, we muſt go to the uninhabited regions of Africa, and America. In the river Amazons, or the river Niger, they are found from eighteen to twenty-ſeven feet in length; and ſometimes lying as cloſe to each other, as a raft of timber in the Thames.

Of this animal there are two kinds; the crocodile, properly ſo called, and the

cayman or alligator. Travellers, however, have rather made the diſtinction than nature; for in the general outline, and in the nature of theſe two animals, they are entirely the ſame. It would be ſpeaking more properly to call theſe animals, the crocodiles of the eaſtern and the weſtern world; for in books of voyages, they are ſo entirely confounded together, that there is no knowing whether the Aſiatic animal be the crocodile of Aſia, or the alligator of the weſtern world. The uſual diſtinctions between the crocodile and alligator are theſe: the body of the crocodile is more ſlender than that of the alligator; it's ſnout runs off tapering from the forehead, like that of a greyhound; while that of the other is indented like the noſe of a lap-dog. The crocodile has a much wider ſwallow, and is of an aſh colour; the alligator is black, varied with white, and is ſaid to be leſs miſchievous.

The crocodile grows to a great length, ſometimes exceeding thirty feet long, from the tip of the ſnout to the end of the tail: its moſt uſual length, however, is eighteen. One which was diſſected by the jeſuits at Siam, was of the latter dimenſions; and the following is the deſcription

ſcription of it. It was eighteen feet and an half, French meaſure, in length; of which the tail was five feet and an half, and the head and neck above two feet and an half. It was four feet nine inches in circumference, in the thickeſt part. The fore legs had the ſame parts and conformation as the arms of a man, both within and without. The hands, if they are entitled to that appellation, had five fingers; the two laſt of which had no nails, and were of a conical figure. The hinder legs, including the thigh and paw, were two feet two inches long; the paws, from the joint to the extremity of the longeſt claws, were above nine inches: they were divided into four toes, of which three were armed with large claws, the longeſt of which was an inch and an half: theſe toes were united by a membrane, reſembling thoſe of a duck, but thicker. The head was long, with a little riſing at the top; but the reſt was flat, and eſpecially towards the extremity of the jaws. It was covered by a ſkin, adhering firmly to the ſkull and to the jaws. The ſkull was rough, and unequal in ſeveral places; and about the middle of the forehead there were two bony creſts, about

two

two inches high: the ſkull between theſe two creſts was proof againſt a muſquet-ball; for it only rendered the part a little white that it ſtruck againſt. The eye, in proportion to the reſt of the body, was very ſmall, and ſo placed within its orbit, that the external part, when the lid was cloſed, was only an inch long, and the line running parallel to the opening of the jaws. It was covered with a double lid, one within and one without: that within was folded in the great corner of the eye, and had a motion towards the tail, but being tranſparent, it covered the eye without hindering the ſight. The iris was very large in proportion to the globe of the eye, and was of a yellowiſh grey colour. Above the eye the ear was placed, which opened from above downwards, as if it were by a kind of ſpring, by means of a ſolid, thick, cartilaginous ſubſtance. The noſe was placed in the middle of the upper jaw, near an inch from its extremity, and was perfectly round and flat, being near two inches in diameter, of a black, ſoft, ſpongy ſubſtance, not unlike the noſe of a dog. The jaws appeared to ſhut one within another; and the common received opi-

nion,

nion, that the animal's under jaw is without motion, is abſolutely falſe; it moves, like the lower jaw in all other animals, while the upper is fixed to the ſkull, and abſolutely immoveable. The animal had twenty-ſeven cutting teeth in the upper jaw, and fifteen in the lower, with ſeveral void ſpaces between them: they were thick at the bottom, and ſharp at the point, being all of different ſizes, except ten large hooked ones, ſix of which were in the lower jaw, and four in the upper. The mouth was fifteen inches in length, and eight and an half in breadth, where broadeſt. The diſtance of the two jaws, when opened as wide as they could be, was fifteen inches and an half. The colour of the body was of a dark brown on the upper part, and of a whitiſh citron below, with large ſpots of both colours on the ſides. From the ſhoulders to the extremity of the tail, it was covered with large ſcales of a ſquare form, diſpoſed like parallel girdles, and fifty-two in number; but thoſe near the tail were thinner than the reſt. The animal was covered not only with theſe, but all over with a coat of armour; which, however, was not proof againſt a muſquet-ball, contrary to what has

has been commonly aſſerted: however, it muſt be confeſſed, that the attitude in which the animal was placed, might contribute to render the ſkin more penetrable; for probably if the ball had ſtruck obliquely againſt the ſhell, it would have flown off. Thoſe parts of the girdles underneath the belly were of a whitiſh colour, and were made up of ſcales of diverſe ſhapes, which were not ſo hard as thoſe on the back.

The gullet was large in proportion to the mouth; and a ball of wood as large as a man's head readily ran down, and was drawn up again. The guts were but ſhort in compariſon, being not ſo long as the animal's body. The tongue, which ſome have erroneouſly aſſerted this animal was without, conſiſted of a thick ſpongy ſoft fleſh, and was ſtrongly connected to the lower jaw. The heart was about the ſize of a calf's heart, and of a bright red colour, the blood paſſing as well from the veins to the aorta as into the lungs. There was no bladder; but the kidneys ſent the urine to be diſcharged by the anus. There were ſixty-two joints in the back-bone, which, though very cloſely united, had ſufficient play to enable the animal to bend like a bow

a bow to the right and the left; ſo that what we hear of eſcaping a crocodile by turning out of the right line, and of it's not being able to wheel readily after its prey ſeems to be fabulous. It is probable that it can turn with great facility, for the joints of its back are not ſtiffer than thoſe of other animals, which can conveniently turn about.

Such is the figure and conformation of theſe formidable animals. They are ſeen in ſome places lying for whole hours, and even days ſtretched in the ſun and motionleſs; ſo that a perſon unacquainted with the ſight, might miſtake them for trunks of trees, covered with a rough and dry bark; but the miſtake would ſoon be fatal, if not prevented: for the torpid animal at the near approach of any living thing, darts upon it with inſtant ſwiftneſs, and at once drags it down to the bottom. In the times of an inundation they ſometimes enter the cottages of the natives, where the dreadful viſitant ſeizes the firſt animal it meets with. There have been ſeveral examples of their taking a man out of a canoe in the ſight of his companions, without their being able to afford him the leaſt aſſiſtance.

Every

Every part of the crocodile is remarkably ſtrong; and its arms both offenſive and defenſive are irreſiſtible. We have ſeen, from the ſhortneſs of its legs, the amazing ſtrength of the tortoiſe: but how inſignificant is the ſtrength of ſuch an animal, compared to that of the crocodile, whoſe legs are very ſhort, and whoſe ſize is ſo ſuperior? The backbone is jointed in the firmeſt manner; the muſcles of the fore and hinder legs are vigorous and ſtrong; and its whole form finely calculated for force. It's teeth are ſharp, numerous, and formidable; it's claws are long and tenacious; but it's principal inſtrument of deſtruction is the tail; with a ſingle blow of which it has frequently overturned a canoe, and ſeized upon the poor ſavage who was the conductor of it.

Though leſs powerful upon land, the crocodile is terrible even there. It ſeldom leaves the water, except when preſſed by hunger, or with a view of depoſiting its eggs. It uſually floats along upon the ſurface, and ſeizes whatever animals come within its reach; but when this method fails, it then goes nearer to the bank. Diſappointed of its fiſhy prey, it there waits covered up among

mong the ſedges, in patient expectation of ſome land animal that comes to drink; the dog, the bull, the tiger, or man himſelf. Nothing is to be ſeen of the inſidious deſtroyer as the animal approaches; nor is its retreat diſcovered till it be too late to eſcape its fury. It ſeizes the victim with a ſpring, and goes at a bound much faſter than ſo unwieldy an animal could be thought capable of exerting; then having ſecured the creature with both teeth and claws, it drags it into the water, ſinks with it to the bottom, and drowns it in an inſtant.

The animal which the crocodile has thus ſurpriſed, ſometimes, indeed, eſcapes from its graſp, wounded, and makes off from the river-ſide. The tyrant, however, purſues with all its force, and often ſeizes it a ſecond time. Thus it is frequently ſeen above half a mile from the bank, in purſuit of ſome animal, which it has wounded beyond the power of eſcaping, and then dragging it back to the ſhore, where it feaſts in ſecurity.

In its depredations along the bank, the crocodile ſometimes ſeizes on a creature as formidable as itſelf, and meets with a moſt deſperate reſiſtance. Frequent combats happen between the cro-

codile and the tiger. Creatures of the tiger kind are continually oppreſſed by a parching thirſt, which keeps them always in the vicinity of great rivers, whither they deſcend to drink very frequently. Upon theſe occaſions they are ſeized by the crocodile; and they die not unrevenged. The inſtant they are ſeized upon, they turn with the greateſt agility, and force their claws into the crocodile's eyes, while he plunges with his fierce antagoniſt into the river. There they continue to ſtruggle for ſome time, till at laſt the tiger is drowned.

The crocodile thus ſeizes and deſtroys every animal, and is equally dreaded by all. Man alone can combat it with ſucceſs. Labat aſſures us, that a negro, with no other weapons than a knife in his right hand, and his left arm wrapped round with a cow's hide, ventures boldly to attack this animal in its own element. As ſoon as he approaches the crocodile, he preſents his left arm, which the animal moſt greedily ſwallows; but ſticking in its throat, the negro has time to give it ſeveral ſtabs under the throat; and the water alſo getting in it at the mouth, which is held involuntarily open, the creature

creature ſoon becomes ſwelled as large as a tun, and expires.

To thoſe who live at a diſtance from the rapacity of theſe animals, theſe ſtories appear ſtrange and romantic. From not having ſeen any thing ſo formidable in the circle of their own experience, they ſhould not, however, determine upon the wonderful tranſactions in diſtant climates. It is probable that theſe, and many other dreadful encounters, happen every day among thoſe foreſts and in thoſe rivers, where the moſt formidable animals are known to reſide; where the elephant and the rhinoceros, the tiger and the hippopotame, the ſhark and the crocodile, have frequent opportunities of meeting, and renewing their engagements.

Crocodiles are taken by the Siameſe in great abundance. The natives of that empire are particularly fond of the capture of all the great animals with which their country abounds. The manner of taking the crocodile in Siam, is by throwing three or four ſtrong nets acroſs a river, at proper diſtances from each other; ſo that if the animal breaks through the firſt, it may be caught by one of the reſt. When it is firſt taken,

it employs the tail with great force; but after many unſucceſsful ſtruggles, the animal's ſtrength becomes exhauſted. Then the natives approach their priſoner in boats, and pierce him with their weapons in the moſt tender parts till he is weakened with the loſs of blood. When he has done ſtirring, they begin by tying up his mouth, and with the ſame cord they faſten his head to his tail, which laſt they bend back like a bow. However, they are not yet perfectly ſecure from his fury; but, for their greater ſafety, they tie his fore-feet, as well as thoſe behind, to the top of his back. Theſe precautions are not uſeleſs; for if they were to omit them, the crocodile would ſoon recover ſtrength enough to do conſiderable miſchief.

The crocodile thus brought into ſubjection, or bred up young, is uſed to divert and entertain the great men of the Eaſt. It is often managed like an horſe; a curb is put into its mouth, and the rider directs it as he thinks proper. Though aukwardly formed, it proceeds with ſome degree of ſwiftneſs; and is thought to move as faſt as ſome of the moſt unwieldy of our own animals, the hog or the cow. Some, indeed, aſſert that

that no animal could eſcape it, but for its difficulty in turning; but to this reſource we could wiſh none would truſt, who are ſo unhappy as to find themſelves in danger.

In the rivers of Africa the crocodile is ſometimes taken in the ſame manner as the ſhark. Several Europeans go together in a large boat, and throw out a piece of beef upon a hook and ſtrong fortified line, which the crocodile ſeizing and ſwallowing, is drawn along, floundering and ſtruggling till its ſtrength is quite exhauſted, when it is pierced in the belly, which is its tendereſt part; and thus after numberleſs wounds is drawn aſhore. In this part of the world alſo, as well as at Siam, this animal makes an object of ſavage pomp near the palaces of their monarchs. Philips informs us, that at Sabi, on the ſlave coaſt, there are two pools of water near the royal palace, where crocodiles are bred as we breed carp in our European ponds.

Hitherto we have deſcribed the crocodile as it is found in unpeopled countries, and undiſturbed by frequent encounters with mankind. In this ſtate it is fierce and cruel, attacking every object that ſeems endued with motion: but

in Egypt, and other countries long peopled, where the inhabitants are civilized and the rivers frequented, this animal is ſolitary and timid. Inſtead of coming to attack a man, it ſinks at his approach with the utmoſt precipitation; and, as if ſenſible of ſuperior power, ever declines the engagement. We have many inſtances, in animated nature, of the contempt which at firſt the lower orders of the creation have for man, till they have experienced his powers of deſtruction. The lion and the tiger among beaſts, the whale among fiſhes, the albatroſs and the penguin among birds, meet the firſt encounters of man without dread or apprehenſion; but they ſoon learn to acknowledge his ſuperiority; and take refuge from his power in the deepeſt receſſes of nature. This may account for the different characters which have been given us of the crocodile and the alligator by travellers at different times: ſome deſcribing them as harmleſs and fearful, as ever avoiding the ſight of a man, and preying only upon fiſhes; others ranking them among the deſtroyers of nature; deſcribing them as furniſhed with ſtrength, and impelled by malignity to do miſchief; repreſenting them

them as the greateſt enemies of mankind, and particularly deſirous of human prey. The truth is, the animal has been juſtly deſcribed by both; being ſuch as it is found in places, differently peopled or differently civilized. Wherever the crocodile has reigned long unmoleſted, it is fierce, bold, and dangerous; wherever it has been harraſſed by mankind, its retreats invaded, and its numbers deſtroyed, it is there timorous and inoffenſive.

Inſtead of being formidable, this animal in ſome places is not only inoffenſive, but is cheriſhed and admired.. In the river San Domingo, the crocodiles are the moſt inoffenſive animals in nature; the children play with them, ride about on their backs, and even beat them ſometimes without receiving the ſmalleſt injury. The inhabitants indeed are very careful of this gentle breed, and conſider them as harmleſs domeſtics.

It is perhaps the ſmell of muſk, which all theſe animals exhale, that renders them agreeable to the ſavages of that part of Africa. They are often known to take the part of this animal which contains the muſk, and wear it as a perfume about their perſons. Travellers are not agreed in what part of the body theſe muſk-

muſk-bags are contained; ſome ſay in the ears; ſome, in the parts of generation; but the moſt probable opinion is, that this muſky ſubſtance is amaſſed in glands under the legs and arms. From whatſoever part of the body this odour proceeds, it is very ſtrong and powerful, tincturing the fleſh of the whole body with its taſte and ſmell. This animal's fleſh is at beſt very indifferent eating; but unleſs the muſk-bags be ſeparated it is inſupportable. The negroes themſelves cannot well digeſt the fleſh; but they conſider a crocodile's egg as the moſt delicate morſel in the univerſe.

Crocodiles always breed near freſh waters; and though they are ſometimes found in the ſea, yet that may be conſidered rather as a place of excurſion than abode. They produce their young by eggs; for which purpoſe the female, when ſhe comes to lay, chuſes a place by the ſide of a river, or ſome freſh-water lake, to depoſit her brood in. She always pitches upon an extenſive ſandy ſhore. The ſhore muſt alſo be gentle and ſhelving to the water, for the greater convenience of the animal's going and returning; and a convenient place muſt be found near the edge of the ſtream,

that the young may have a ſhorter way to go. When all theſe requiſites are adjuſted, the animal is ſeen cautiouſly ſtealing up on ſhore to depoſit her burden. The preſence of a man, a beaſt, or even a bird, is ſufficient to deter her at that time; and if ſhe perceives any creature looking on, ſhe infallibly returns. But if nothing appears, ſhe begins ſcratching up the ſand with her fore paws, and making a deep hole in the ſhore. There ſhe depoſits from eighty to an hundred eggs, of the ſize of a tennis-ball, and of the ſame figure, encloſed in a tough white ſkin like parchment. She takes above an hour to perform this taſk; and then covering up the place ſo artfully that it can ſcarcely be perceived, ſhe goes back to return again the next day. On her return, ſhe lays about the ſame number of eggs; and as many the day following. Thus having depoſited her whole quantity, and having covered them cloſe up in the ſand, they are ſoon vivified by the heat of the ſun; and at the end of thirty days, the young ones begin to break open the ſhell. The female is then inſtinctively taught that her young ones require relief; ſhe therefore goes up on land to ſcratch away the ſand, and

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ſet them at liberty. They ſoon avail themſelves of their liberty; a part run unguided to the water; and another part aſcend the back of the female, and are carried thither in greater ſafety. But the moment they arrive at the water, all natural connection ceaſes: when the female has introduced her young to their natural element, ſhe and the male become among the number of their moſt formidable enemies, and devour as many of them as they can. The whole brood ſcatters into different parts at the bottom; and by far the greateſt number are deſtroyed.

It is not the crocodile alone, however, that is thus found to thin their numbers; the eggs of this animal are not only a delicious feaſt to the ſavage, but are eagerly ſought after by every beaſt and bird of prey. The ichneumon was erected into a deity among the ancients, for its ſucceſs in deſtroying the eggs of theſe monſters: at preſent that ſpecies of the vulture called the gallinazo is their moſt prevailing enemy. All along the banks of great rivers, for thouſands of miles, the crocodile is ſeen to propagate in numbers that would ſoon over-run the earth, but for the vulture, which ſeems appointed

ed by Providence to abridge its fecundity. Theſe birds are ever found in greateſt numbers where the crocodile is moſt numerous; and hiding themſelves within the thick branches of the trees that ſhade the banks of the river, they ſilently watch the female, and permit her to lay all her eggs without interruption. When ſhe has retired, they encourage each other with cries to the ſpoil; and flocking together upon the hidden treaſure, tear up the eggs, and devour them in leſs time than they were depoſited. They are equally diligent in attending the female while ſhe is carrying her young to the water; for if any one of them happens to drop by the way, it is ſure to receive no mercy.

To what age the crocodile lives we are not certainly informed; Ariſtotle ſays, it lives the age of man: but the ancients ſo much amuſed themſelves in inventing fables concerning this animal, that even truth from them is ſuſpicious. What we know for certain from the ancients is, that among the various animals that were produced to fight in the amphitheatre at Rome, the combat of the crocodile was not wanting*. Marcus

* Plin. lib. viii. c. 26.

Scaurus

Scaurus produced them living in his unrivalled exhibitions; and the Romans conſidered him as the beſt citizen, becauſe he furniſhed them with the moſt expenſive entertainments.

## THE SALAMANDER.

AS the ancients ſaw the earth, the air, and water inhabited, fancy was ſet to work to form an inhabitant of fire; and thus to people every part of nature. They have deſcribed a lizard that is bred from heat, that lives in the flames, and feeds upon fire as its proper nouriſhment. Is is univerſally known, however, that there is no ſuch animal exiſting.

The modern ſalamander, as already obſerved, is an animal of the lizard kind, and a large tribe is comprehended under this name. Seven ſorts of ſalamanders have been deſcribed by Seba; and if we ſuppoſe the tail of a lizard applied to the body of a frog, we ſhall form a tolerable idea of their figure. The common lizard is long, ſmall, and taper; the ſalamander, like the frog, has its eyes towards the back of the head; but it differs more from the lizard tribe in its nature and conformation than in its figure.

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The ſalamander is an heavy torpid animal; the lizard tribe are active, reſtleſs, and ever in motion.

The ſalamander, and many others of the lizard tribe, are ſaid to have venom; but it is certain that all with which we are acquainted in this country, are perfectly harmleſs; and it is equally true, that, for a long time, till our prejudices were removed, we conſidered not only the newt, but the ſnake and the blind-worm, as fraught with the moſt deſtructive poiſon. At preſent we have got over theſe prejudices; and, it is probable, that, if other nations made the ſame efforts for information, it would be found, that the malignity of moſt, if not all, of the lizard tribe, was only in the imagination.

The whole tribe of ſalamanders, from the moron to the gekko, are ſaid to be venomous to the laſt degree; yet, when experiments have been tried, no arts, no provocations, could excite theſe animals to the rage of biting. They ſeem timid and inoffenſive, feeding only upon worms and inſects; quite deſtitute of fangs, like the viper; their teeth are ſo very ſmall, that they are hardly able to inflict a wound. But as the teeth are thus incapable

pable of offending, the people of the countries where they are found have recourſe to a venomous ſlaver, which, they ſuppoſe, iſſues from the animal's mouth; they alſo tell us of a venom iſſuing from the claws: even Linnæus ſeems to acknowledge the fact; but thinks it a probable ſuppoſition, that this venom may proceed from their urine.

The gekko is the moſt notorious for its powers of miſchief: yet, we are told by thoſe who load it with that calumny, that it is very friendly to man, and though ſupplied with the moſt deadly virulence, is yet never known to bite. It would be abſurd in us, without experience, to pronounce upon the noxious or inoffenſive qualities of animals: yet it is moſt probable, from an inſpection of the teeth of lizards, and from their inoffenſive qualities in Europe, that the gekko has been unjuſtly accuſed; and that its ſerpent-like figure has involved it in one common reproach with ſerpents.

The ſalamander beſt known in Europe, is from eight to eleven inches long, uſually black, ſpotted with yellow; and when taken in the hand feeling extremely cold. There are ſeveral kinds. Our Black Water Newt is reckoned among

mong the number. The idle report of its being inconſumable in fire, has cauſed many of theſe poor animals to be burnt; but we cannot ſay as philoſophical martyrs; ſince ſcarce any philoſopher could think it neceſſary to make the experiment. When thrown into the fire, the animal is ſeen to burſt with the heat of its ſituation, and to eject its fluids. We are gravely told, in the Philoſophical Tranſactions, that this is a method the animal takes to extinguiſh the flames.

The ſalamander differs very little internally from other animals of the lizard kind. It is furniſhed with lungs that ſometimes ſerve for the offices of breathing; with a heart that has its communications open, ſo that the animal cannot eaſily be drowned. But what deſerves particular notice is the manner of this animal's bringing forth its young alive *. "The ſalamander begins to "ſhow itſelf in ſpring, and chiefly dur-"ing heavy rains. When the warm "weather returns, it diſappears; and "never leaves its hole, during either

* Acta Hafnienſia. ann. 1676. Obſerv. 11. Memoires de l'Academie Royale de Sciences, tom. iii. part 3. p. 80.

" great heats or ſevere colds, both which " it equally fears. When taken in the " hand, it appears like a lump of ice; " it conſequently loves the ſhade, and " is found at the feet of old trees, ſur- " rounded with bruſh-wood at the bot- " tom. It is fond of running along " new-ploughed grounds; probably to " ſeek for worms, which are its uſual " food. One of theſe," ſays my author, " I took alive ſome years ago in a ditch " that had been lately made. I laid it at " the foot of the ſtairs upon coming " home, and there it diſgorged from the " throat a *worm* three inches long, that " lived for an hour after, though wound- " ed as I ſuppoſe by the teeth of the a- " nimal. I afterwards cut up another " of theſe lizards, and ſaw not leſs than " fifty young ones, reſembling the pa- " rent, come from its womb, all alive, " and actively running about the room." It were to be wiſhed the author had uſed another word beſide that of *worm*; as we now are in doubt whether he means a real worm, or a young animal of the lizard ſpecies: had he been more explicit, and had it appeared that it was a real young lizard, which I take to be his meaning, we might here ſee a wonder of

nature,

nature, brought to the proof which many have aſſerted, and many have denied. I mean the refuge which the young of the ſhark, the lizard, and the viper kinds, are ſaid to take, by running down the throat of the parent, and there finding a temporary ſecurity. The fact, indeed, ſeems a little extraordinary; and yet it is ſo frequently atteſted by ſome, and even believed by others, whoſe authority is reſpectable, among the number of whom we find Mr. Pennant, that the argument of ſtrangeneſs muſt give way to the weight of authority.

There is no doubt, however, of the animal's being viviparous, and producing above fifty at a time. They are produced in full perfection, and quickly leave the parent to ſhift for themſelves. Theſe animals, in the lower ranks of nature, want ſcarce any help when excluded; they ſoon complete the little circle of their education; and in a day or two are capable of practiſing all the arts of ſubſiſtance and evaſion practiſed by their kind.

They are all amphibious, or at leaſt are found capable of ſubſiſting in either element, when placed there; if thoſe taken from land are put into water, they

continue there in ſeeming health; and, on the contrary, thoſe taken from the water will live upon land. In water, however, they exhibit a greater variety in their appearance; and what is equally wonderful with the reſt of their hiſtory, during the whole ſpring and ſummer this water lizard changes its ſkin every fourth or fifth day; and during the winter every fifteen days. This operation they perform by means of the mouth and the claws; and it ſeems a work of no ſmall difficulty and pain. The caſt ſkins are frequently ſeen floating on the ſurface of the water: they are ſometimes ſeen alſo with part of their old ſkin ſtill ſticking to one of their limbs, which they have not been able to get rid of. This alſo often corrupts, and the leg drops off; but the animal does not ſeem to feel the want of it, for the loſs of a limb to all the lizard kind is but a trifling calamity. They can live ſeveral hours even after the loſs of their head: and for ſome time, under diſſection, all the parts of this animal ſeem to retain life; but the tail is the part that longeſt retains its motion. Salt ſeems to be much more efficacious in deſtroying theſe animals, than the knife; for, upon being ſprinkled with it,

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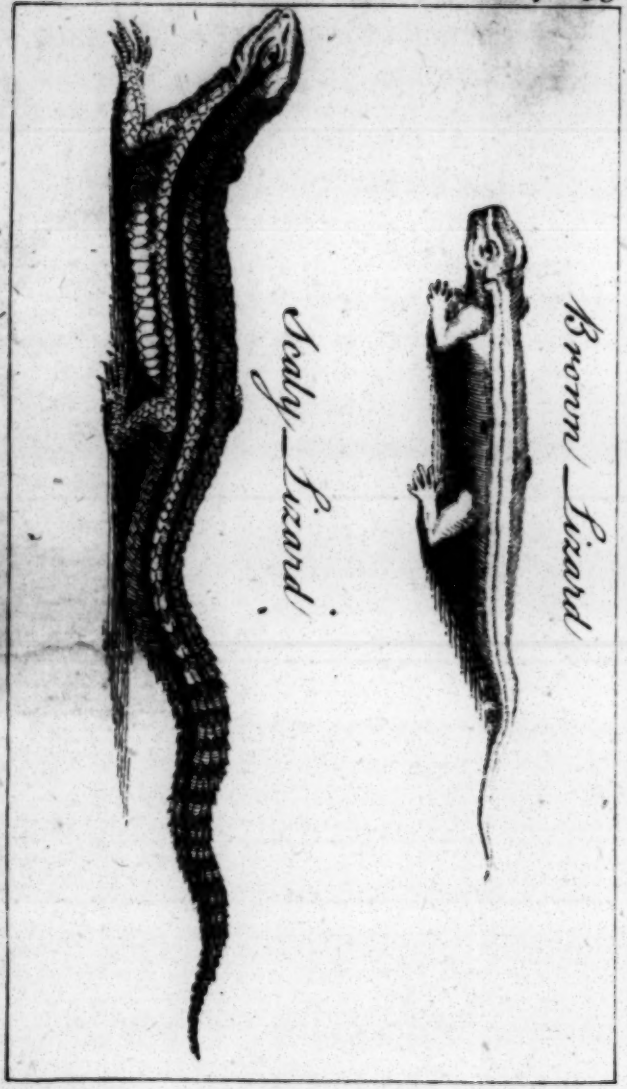

Brown Lizard

Scaly Lizard

the whole body emits a viſcous liquor, and the lizard dies in a few minutes, in great agonies.

The lizard kind are alſo tenacious of life in another reſpect, and the ſalamander among the number. They ſuſtain the want of food in a ſurpriſing manner. One of them, brought from the Indies, lived nine months, without any other food than what it received from licking a piece of earth on which it was brought over *: another was kept by Seba in an empty vial for ſix months, without any nouriſhment; and Redi talks of a large one, brought from Africa, that lived eight months without taking any nouriſhment whatever. Indeed, as many of this kind, both ſalamanders and lizards, are torpid, or nearly ſo, during the winter, the loſs of their appetite for ſo long a time is the leſs ſurpriſing.

## THE SCALY LIZARD.

THE length of this animal, from the noſe to the hind legs, is about three inches; and from thence to the end of the tail, three inches and three quarters. It has a black liſt along the back, and a brown one on each ſide; beneath that it has a

* Phil. Tranſ. ann. 1661. No. 21. Art. 7.

broad

broad black one. The belly is yellow, and the ſcales large and even. The ſcales on the back are ſmall, varied with black and brown. The legs and feet are duſky, each foot having five toes furniſhed with claws. This ſpecies is extremely nimble: in hot weather it is frequently ſeen basking on the ſides of dry banks or old trees; but, on being obſerved, it immediately retreats to its hole. The food of this and every other ſpecies of Engliſh lizards, is inſects. All the lizards of this country are perfectly harmleſs; it is their form only that diſguſts us, and has occaſioned them to be repreſented in an unfavourable light.

## THE WARTY LIZARD.

THIS animal is ſix inches and an half in length, of which the tail is about three inches and a quarter. The iris of the eye is yellow. The head and part of the back is flat, of a dark dusky colour, and covered with ſmall pimples or warts: the ſides are covered with white warts: the belly is of a bright yellow, ſpotted with black. The fore-feet are divided into four toes; the hind feet with five; they are all duſky, ſpotted with yellow, and without nails. The pace of this lizard is ſlow and crawling.

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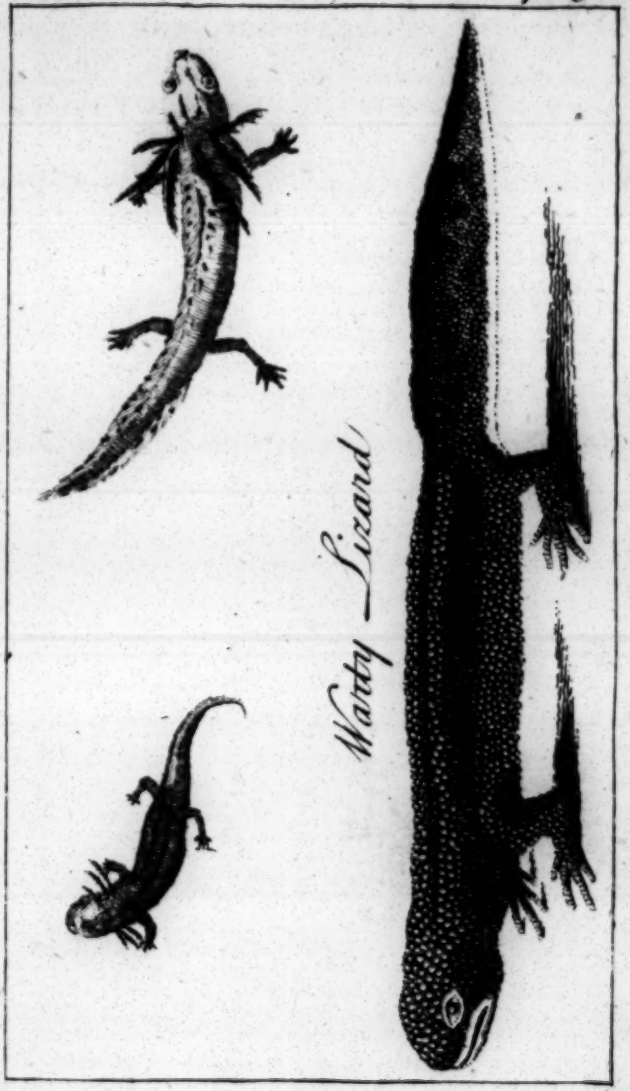

Warty Lizard

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## THE GREEN LIZARD.

THE green lizard is ſo called from its colour, and it is larger than the common ſort. It delights in warm countries, and is very common in Italy. They are found on trees in the ſummer-time, where they make a noiſe like the croaking of frogs.

## THE BROWN LIZARD.

THIS Species is about three inches long; the body is ſlender; the tail long, ſmall and taper. The upper part of the body is of a pale brown, marked on each ſide of the back with a narrow black line, extending to the end of the tail. The belly is of a pale yellow, marked with ſmall duſky ſpots.

There is a ſpecies called the ſnake-ſhaped lizard, which ſeems to be of that kind which connects the ſerpent and lizard genus, having a long ſlender body, and very ſmall legs.

## THE TARANTALA LIZARD.

THIS animal is very common near Naples and Rome: it has a rough ſkin of an aſh-colour, and is thicker and more fleſhy than other lizards. It uſually haunts the ruins of old buildings, and walls; and has a very diſagreeable aſpect, ſtriking

ſtriking the beholders with a kind of dread. When Mr. Ray firſt ſaw one, he ſays he ſhuddered as it were by inſtinct. It is however ſaid, that it is perfectly harmleſs, and the horror with which it affects mankind, is principally owing to its uglineſs and filthy aſpect.

## The TARAQUINA.

THIS animal, which is a Braſilian lizard, is about a foot in length. The body is round, and covered with triangular aſh-coloured ſcales. It delights in gardens, and to be near houſes: when it ſees any thing, it nods the head in a very ſurpriſing manner; and runs nimbly from place to place, making ſtrange motions with its body. It is ſaid, that when this animal ſees a man ſleeping, and a ſerpent, or any other venomous animal coming near him, it never fails to wake him that he may avoid the danger.

The Ameiva, which is a lizard of South America, is in all reſpects like the former, except that it has a forked tail.

## The IGUANA.

THE length of this animal is about five feet, and the body is about as thick as a man's thigh: the skin is covered with ſmall ſcales, like thoſe of a ſerpent; and

and the back is furniſhed with a row of prickles, that ſtand up, like the teeth of a ſaw: the eyes ſeem to be but half opened, except when the animal is angry, and then they appear large and ſparkling: both the jaws are full of very ſharp teeth, and the bite is dangerous though not venomous, for it never quits its hold till it is killed. The male has a ſkin hanging under his throat, which reaches down to his breaſt; and, when diſpleaſed, he puffs it up like a bladder: he is one third larger and ſtronger than the female; tho' the ſtrength of either avails them little towards their defence. The males are aſh-coloured, and the females green.

The fleſh of the iguana may be conſidered as the greateſt delicacy of Africa and America; and the ſportſmen of thoſe climates go out to hunt it as we do in purſuit of the pheaſant or the hare. In the beginning of the ſeaſon, when the great floods of the tropical climates are paſt away, and vegetation ſtarts into univerſal verdure, the ſportſmen are ſeen, with a nooſe and a ſtick, wandering along the ſides of the rivers, to take the iguana. This animal, though apparently formed for combat, is the moſt harmleſs creature of all the foreſt; it lives among the trees,

or

or ſports in the water, without ever offering to offend; there, having fed upon the flowers of the mahot, and the leaves of the mapou, that grow along the banks of the ſtreams, it repoſes upon the branches of the trees that hang over the water. Upon land the animal is ſwift of foot; but when once in poſſeſſion of a tree, it ſeems conſcious of the ſecurity of its ſituation, and never offers to ſtir. There the ſportſman eaſily finds it, and as eaſily faſtens his nooſe round its neck: if the head be placed in ſuch a manner that the nooſe cannot readily be faſtened, by hitting the animal a blow on the noſe with the ſtick, it lifts the head, and offers it in ſome meaſure to the nooſe. In this manner, and alſo by the tail, the iguana is dragged from the trees, and killed by repeated blows on the head.

## THE CAMELEON.

THIS little animal, like the crododile proceeds from an egg; and it alſo nearly reſembles that formidable creature in form; but it differs conſiderably in its ſize and its appetites; it is not above eleven inches long, and delights to ſit upon trees, being afraid of ſerpents, from

which

which it is unable to eſcape on the ground. The head of a large cameleon is almoſt two inches long; and from thence to the beginning of the tail, four and an half; the tail is five inches long, and the feet two and an half; the thickneſs of the body is different at different times; for ſometimes, from the back to the belly, it is two inches, and ſometimes but one; for it can blow itſelf up, and contract itſelf, at pleaſure. This ſwelling and contraction is not only of the back and belly, but of the legs and tail.

Theſe tumours do not proceed from a dilatation of the breaſt in breathing, which riſes and falls by turns, but are very irregular, and ſeem adopted merely from caprice. The cameleon is often ſeen, as it were, blown up for two hours together; and then it continues growing leſs and leſs inſenſibly; for the dilatation is always quicker and more viſible than the contraction. In the contracted ſtate, the animal appears extremely lean; the ſpine of the back ſeems ſharp, and all the ribs may be numbered, the tendons of the legs and arms may alſo be ſeen very diſtinctly.

This method of puffing itſelf up is ſimilar to that in pigeons, whoſe crops are

ſometimes greatly diſtended with air. The cameleon has a power of driving the air it breathes over every part of the body, but it only gets between the ſkin and the muſcles; for the muſcles themſelves are never ſwollen. The ſkin is very cold to the touch: and tho' the animal ſeems ſo lean, there is no feeling the beating of the heart. The ſurface of the ſkin is unequal, and has a grain not unlike ſha- green, but very ſoft; becauſe each emi- nence is as ſmooth as if it were poliſhed. Some of theſe little protuberances are as large as a pin's head, on the arms, legs, belly and tail; but on the ſhoulders and head they are of an oval figure, and a little larger: thoſe under the throat are ranged in the form of a chaplet, from the lower lip to the breaſt. The colour of all theſe eminencies, when the came- leon is at reſt in a ſhady place, is of a bluiſh grey; and the ſpaces between are of a pale red and yellow.

But the wonderful part of this animal's hiſtory, is when it is removed into the ſun. At firſt it appears to ſuffer no change of colour, its greyiſh ſpots ſtill continuing the ſame; but the whole ſur- face ſoon appears to imbibe the rays of light; and the ſimple colouring of the bo-

body changes into a variety of beautiful hues. Wherever the light comes upon the body, it is of a tawny brown; but that part of the ſkin on which the ſun does not ſhine, changes into ſeveral brighter colours, pale yellow, or vivid crimſon; which form ſpots of half the ſize of a man's finger; ſome of theſe deſcend from the ſpine half way down the back; and others appear on the ſides, arms, and tail. When the ſun ceaſes to ſhine, the original grey colour returns by degrees, and covers all the body. Sometimes the animal becomes all over ſpotted with brown ſpots, of a greeniſh caſt. When wrapped up in a white linen cloth for two or threee minutes, the natural colour becomes much lighter; but not quite white, as ſome authors have pretended: however, from hence it muſt not be concluded, that the cameleon aſſumes the colour of the objects which it approaches; this is entirely an error, and probably has taken its riſe from the continual changes it appears to undergo.

An ample deſcription of the cameleon is given us by Le Bruyn, in his voyage to the Levant. During his abode at Smyrna, he bought ſeveral of this kind, and, to try how long they could live,

kept four of them in a cage, permitting them at times to run about the houſe. The freſh ſea breeze ſeemed to give them moſt ſpirits and vivacity; they opened their mouths to take it in: he never ſaw them eat any thing, except now and then a fly, which they took half an hour to ſwallow: he obſerved their colour frequently change, three or four times ſucceſſively, without being able to find out any cauſe for ſuch alterations: their common colour he found to be grey, or rather a pale mouſe colour; but its moſt frequent changes were into a beautiful green, ſpotted with yellow: ſometimes the animal was marked all over with dark brown; and this often changed into a lighter brown: ſome colours, however, it never aſſumed; and, contrary to what was ſaid above, he found red to be among the number.

Tho' he was particularly careful, he was unable to preſerve any of them alive above five months; and many of them died in four. When the cameleon changes place, and attempts to deſcend from an eminence, it moves with the utmoſt precaution, advancing one leg very deliberately before the other, till ſecuring itſelf by holding whatever it can graſp by the tail

tail. It ſeldom opens the mouth, except for freſh air; and when that is ſupplied, diſcovers its ſatisfaction by its motions, and the frequent changes of its colour. The tongue is ſometimes darted out after its prey, which is flies; and this is as long as the whole body. The eyes are remarkably little, though they ſtand out of the head: they have a ſingle eye-lid, like a cap with a hole in the middle, thro' which the ſight of the eye appears, which is of a ſhining brown; and round it there is a little circle of a gold colour: but the moſt extraordinary part of their conformation is, that the animal often moves one eye, when the other is entirely at reſt; nay, ſometimes one eye will ſeem to look directly forward, while the other looks backward; and one will look downwards, while the other looks into the air.

## THE VIPER.

THIS animal differs from other ſerpents in moving more ſlowly, in never bounding or leaping, and in bringing its young to perfection before they are excluded. The females of other ſerpents lay eggs, which are either hatched by the

heat of the ſun, or in the place of the retreat.

Vipers are found in many parts of this iſland, particularly in the dry, ſtony and chalky countries. Providence is extremely kind in not ſuffering this ſpecies to be prolific, more than ten or eleven eggs being ſeldom found in one viper: theſe are about the ſize of a blackbird's egg, and appear as if they were chained together.

The viper ſeldom exceeds two feet in length, though they are ſometimes found very little ſhort of three feet. The ground colour is a dirty yellow; that of the female of a deeper yellow. Its back is marked with a kind of chain of black ſpots, touching each other at the points. A little below is another row of blackiſh ſpots, and on the lower part of the ſides there is a line conſiſting of little white ſpots, and then another of black, which are larger. The head is inflated, which diſtinguiſhes it from the common ſnake. The tongue is forked; the teeth ſmall; the four canine teeth are placed two on each ſide of the upper jaw; the inſtruments of poiſon are long, crooked, and moveable; and can be raiſed and depreſſed at pleaſure; they are hollow from near

near the point to their baſe, and the action which gives the wound, forces the fatal juice into it, through the tooth.

Vipers generally caſt their ſkins twice a year, and the ſucceeding ones always appear brighter and more beautiful, than thoſe which they have quitted. Soon after this, another ſkin begins to be formed; ſo that it may be ſaid always to have a double ſkin. When the ſkin is taken off, and the viper cut into ſeveral pieces, it will remain alive for ſeveral hours, and the head is always ready to bite; nor will the bite be leſs dangerous than at another time. Vipers do not, like other ſerpents, make holes in the earth; but uſually hide themſelves under ſtones, or the ruins of old houſes. In fine weather, however, they are frequently found in tufts of graſs, and among buſhes.

This animal is ſaid not to arrive at its full growth in leſs than ſix or ſeven years; but it is capable of engendering at three.

The tongue of the viper conſiſts of two long fleſhy round bodies, which terminate in ſharp points, and are very pliable. It is about an inch and an half in length, and its root is ſtrongly connected to the neck by two tendinous bodies, near a quarter of an inch in length.

The

The tongue of ſome vipers has three or four points; and, though they are often darted out, they do no injury, except that of terrifying thoſe that behold them; for they principally ſerve to catch the ſmall animals on which the viper feeds.

We are aſſured, from good authority, that the young of the viper, when terrified, will run down the throat of the parent and ſeek ſhelter in its belly, in the ſame manner as the young of the oppoſſum, retire into the ventral pouch of the old one. Hence it has been imagined by ſome, that the viper is ſo unnatural as to devour its own young.

Theſe animals, when at liberty, remain torpid throughout the winter; but when they have been confined, they have never been obſerved to take their annual repoſe.

Aretæus, ſays Dr. Mead, who has moſt accurately deſcribed the elephantiaſis, commends, as Craterus did the eating of vipers, inſtead of fiſh, in the ſame diſeaſes. And to this purpoſe I remember, that as Lopez, in his relations of the kingdom of Congo, in Africa, takes notice how greedily the negroes eat adders, roaſting them, and eſteeming them as the moſt delicious food; ſo Dampier, alſo, informs

informs us, that the natives of Tonquin, in the Eaſt-Indies, treat their friends with arrack, in which ſnakes and ſcorpions have been infuſed, accounting this, not only a great cordial, but, alſo, an antidote againſt the leproſy, and all other ſorts of poiſon.

The phyſicians in Italy and France, very frequently preſcribe the broth and jelly of vipers fleſh, for much the ſame uſes, that is, to invigorate and purify the maſs of blood exhauſted with diſeaſes, or tainted with ſome vicious and obſtinate ferment.

From all this it appears, that the main efficacy of the viperine fleſh is, to quicken the circulation of the blood, promote its due mixture, and by this means cleanſe and ſcour the glands of thoſe ſtagnating juices, which, turning to acidity, are the origin of many, at leaſt, of thoſe troubleſome diſtempers in the ſurface of the body, which go under the names of ſcrophulous, and leprous.

Theſe good effects are owing to that penetrating, ſtrong ſalt, with which the ſubſtance of theſe creatures, in a very great proportion, abounds; and the reaſon of this is from the food they live on, which are lizards, moles, &c. whoſe nature

ture every one knows to be ſuch as muſt neceſſarily, when they are diſſolved in the ſtomach, ſupply the blood with a great quantity of active and volatile parts. And herein lies the difference between the fleſh of vipers, and that of other innocent ſerpents, which, feeding upon graſs and herbs, do not recommend themſelves to us by any of thoſe properties, which are in ſo eminent a degree found in the former.

Whoever reflects on what has been ſaid on this head, will very readily acknowledge, that our phyſicians deal too cautiouſly or ſparingly with a remedy, which may be applied to very good purpoſes, when they preſcribe a few grains of the powder of dried vipers, or make up a ſmall quantity of their fleſh in troches; whereas, if ſervice be really to be done this way, the patient ought to eat frequently of viper-jelly, or broth; or rather, as the ancient manner was, to boil vipers, and eat them like fiſh; if this food will not go down, (though really very good and delicious fare) to make uſe at leaſt of wine, in which vipers have for a long time been infuſed, by which I know a very obſtinate lepra has been removed; or, laſtly, in ſome caſes,

caſes, eſpecially where wine is not convenient, to take good quantities of their volatile ſalt, in which alone the virtue of the before-named medicines principally reſide.

It is worthy our obſervation, continues Dr. Mead, that the viper can move the jaw-bones on one ſide, without moving thoſe of the other; for they are not joined together at the extremes, as in other animals; which contrivance is very beneficial to it in the ſwallowing its prey; for while the teeth on one ſide ſtand unmoved, and fixed in the fleſh to hold it, thoſe on the other ſide are brought forward, to draw it in farther; then they keep it faſt till the former jaws advance again in their turn: thus they act ſucceſſively, and force the animal entire into the oeſophagus, whoſe muſcular fibres are very weak, and can help but little in the buſineſs.

The ſymptoms which follow upon the bite of a viper, when it faſtens either one or both its greater teeth, in any part of the body, are an acute pain in the place wounded, with a ſwelling, at firſt red, but afterwards livid, which, by degrees, ſpreads farther to the neighbouring parts with great faintneſs, and a quick, though low,

low, and ſometimes interrupted pulſe, great ſickneſs at the ſtomach, with bilious convulſive vomitings, cold ſweats, and ſometimes pains about the navel; and if the cure be not ſpeedy, death itſelf, unleſs the ſtrength of nature prove ſufficient to overcome theſe diſorders; and though it does, the ſwelling ſtill continues inflamed for ſome time; nay, in ſome caſes more conſiderably upon the abating of the other ſymptoms, than at the beginning; and often, from the ſmall wound, runs a ſanious liquor, and little puſtules are raiſed about it; the colour of the whole ſkin is changed yellow, as if the patient had the jaundice.

Theſe miſchiefs, although different climates, ſeaſon of the year more or leſs hot, the greater or leſſer rage of the viper, the beaſt itſelf, of a larger or ſmaller ſize, and, conſequently, able to communicate more or leſs venom, and the like circumſtances, may variouſly heighten or abate them, yet uſually diſcover themſelves much after the ſame manner in all; unleſs the bite happen not to be accompanied with the effuſion of that liquor, which is the main inſtrument and cauſe of this violent and ſhocking diſturbance.

But

But before I proceed to inquire into the nature and manner of acting of this juice, it may be proper to take notice, that this is not made on purpoſe to be deadly and deſtructive to mankind; but that the true deſign of it is (though authors have not regarded it) to perform an office and ſervice of ſo great moment to the preſervation of the individual, that without it this creature could not ſubſiſt.

For vipers live principally upon lizards, frogs, toads, mice, moles, and the like animals, which they do not chew, but ſwallow down whole, and they lie in the ſtomach; or if that be not large enough to receive them, partly in that, and partly in the oeſophagus, which is membranous, and capable of great diſtention, till by the ſalival juices of thoſe parts, together with the help of the fibres of the ſtomach, and the contraction of the muſcles of the abdomen, they are gradually diſſolved into a fluid ſubſtance, fit for the nouriſhment of their bodies, which is the work of many days: this is one reaſon why theſe creatures can live ſo long without taking any freſh food, which I have known them to do three or four months; another is, that their blood is a groſſer and more viſcid fluid than that

of moſt other animals; ſo that there is but a very little expence of it, by tranſpiration, and, conſequently, leſs need of recruit; this not only microſcopes diſcover, but reaſon teaches; becauſe there is but very little muſcular force in the ſtomach to comminute the food, and make a chyle of fine parts; and therefore the blood muſt accordingly be of a tough and clammy conſiſtence. Beſides, the heart of a viper has properly but one ventrical, and the circulation of the blood is performed after the ſame manner as it is in a frog and tortoiſe, in which not above one-third of it paſſes through the lungs; on which account its communication in them by the air is proportionably leſſer than in other animals. Now ſuch a manner of feeding as this, neceſſarily requires that the prey ſhould, upon the firſt catching, be immediately killed, otherwiſe it were by no means fit to be let into the ſtomach; for we are not to think, that the force of this part would be alone ſufficient to deſtroy it, the ſubtilty of a living creature (beſides the conſideration of the weakneſs of the fibres) being in a great meaſure able to elude that, as indeed we every day find live animals in the ſtomachs of others; and therefore

to

to do this, is the proper uſe both of the teeth, and their poiſon; for which being deſigned and adapted, it is no wonder if the viper, the ſame way by which it deſtroys its prey, proves ſometimes miſchievous to any other creature beſides, when it happens to be enraged, or by any provocation ſtirred up to bite.

It is worth the while, ſays Dr. Mead, in the next place, to conſider the cure of this miſchief, which, without all doubt, ought to be by ſuch external management of the wound as may immediately deſtroy the infuſed venom.

Boyle experienced an hot iron, held as near the place as the patient could poſibly endure it, very effectual to this purpoſe: but the ſame method did not anſwer expectation, in the famous caſe related by Charas.

An extraordinary virtue againſt this and other venomous bites, is aſcribed to the ſnake-ſtones brought from the Eaſt-Indies, one of which is to be preſently applied to the part, and let ſtick till it drop off: theſe are ſaid to be taken out of the head of the ſerpent, called by the Portugueſe, cobra de capello, and to ſuck the poiſon out of the wound. Redi made trials with ſeveral of them, but

found no ſervice from any: yet Baglivi tells us of a terrible bite of a ſcorpion cured this way. Monſieur Charas's pigeons all died, though theſe were immediately clapped on, and ſtuck cloſe to the wound: but Havers ſaw a good effect of one upon a dog, who, though ſeverely bitten, ſuffered no harm; nor any farther mark of the poiſon, than a livid circle round the place.

In plain truth, as theſe celebrated ſtones do not ſeem to be what it is pretended they are, but rather factitious bodies, compounded, perhaps of calcined bones, and ſome teſtaceous matters mixt together; ſo, by reaſon of their ſpongy and porous texture, they very readily adhere to any moiſtened part of the fleſh, and imbibe whatſoever humidity they meet with: this their quality any one may experience, by holding one of them to the roof of his mouth: and it is upon this ſcore that, when put into water, bubbles are raiſed by the air in their interſtices, which ſome have too fondly thought to be the effects of their throwing out the venom they had ſucked in.

Their make being thus, ſome part at leaſt of the poiſonous juice may eaſily be drawn out of the wound, by ſuch an application;

plication; and yet ſo much of it may ſometimes happen to remain in the fleſh, as may make the bite however to prove mortal. And thus it fared with a pigeon, to the thigh of which, firſt bitten by a viper, I applied one of the ſtones; for though it ſtuck faſt to the wound, and thus ſaved the life for about four hours (whereas others uſually died in about half an hour), yet, after this, the mortification of the part prevailed to that degree as to become fatal to the tender creature.

But our viper-catchers have a remedy far beyond all theſe, in which they place ſo great confidence, as to be no more afraid of a bite than of a common puncture, immediately curing themſelves by the application of their ſpecific.

This, though they keep as a great ſecret, I have, however, upon ſtrict inquiry, found out to be no other than the axungia viperina preſently rubbed into the wound. And to convince myſelf of its good effects, I enraged a viper to bite a young dog in the noſe; both the teeth were ſtruck deep in; he howled bitterly, and the part began to ſwell. I diligently applied ſome of the axungia I

had ready at hand, and he was very well the next day.

But becauſe ſome gentlemen who ſaw this experiment were apt to impute the cure rather to the dog's ſpittle (he licking the wound) than to the virtue of the fat, we cauſed him to be bit again in the tongue, forbearing the uſe of our remedy, and he died within four or five hours.

At another time I made the like trial with the ſame ſucceſs.

As this axungia conſiſts of clammy and viſcid parts, which are withal more penetrating and active than moſt other oily ſubſtances, ſo theſe, without all doubt, involve, and, as it were, ſheath the volatile ſalts of the venomous liquor, and thus prevent their ſhooting out into thoſe cryſtalline ſpicula, which we have obſerved to be the main inſtruments of that deadly miſchief which attends the bite.

By this means it comes to paſs, that this cure, if rightly managed, is ſo eaſy and certain, as not to need the help of any internal medicines to forward it; but theſe however muſt take place where, through want of the other, the poiſon is ſpread farther, and has tainted the whole maſs of blood.

Nor

Nor yet is it neceſſary, even in this caſe, to fatigue the patient with a farago of theriacas and antidotes; for the volatile ſalt of vipers is alone ſufficient to do the work, if given in juſt quantities, and duly repeated; provided moderate ſweats be encouraged in bed: thus it ſucceeded with Monſieur Charas, and in ſome others I could relate; in one of which the miſchief had gone ſo far as to induce an univerſal icterus.

I muſt remark, that ſince Dr. Mead wrote the treatiſe of poiſons, from which ſome of theſe particulars relative to the viper are extracted, a man and his wife, who made it their buſineſs to catch vipers, came from Bath to Oxford, and from thence to London; and, after having ſhewn a great number of experiments, with reſpect to the bite of this animal, at laſt diſcovered an effectual remedy, which conſiſts in nothing more, than chafing the part wounded with olive-oil, before the fire; and, if the caſe ſhould be extremely bad, wrapping the entire affected limb in a cerate, made of white-lead, and the ſame oil.

I muſt further obſerve, that as the viperine poiſon acts by inducing a coagulation of the blood, which ſpreads gradually

dually from the wounded part to the heart, of which I have ſeen an hundred inconteſtable inſtances; and as rubbing in the oil, prevents the coagulation, and reſolves the blood already coagulated; hence, perhaps, we may account for the efficacy of unctions, ſo much practiſed by the ancient phyſicians, eſpecially thoſe of the methodic ſect.

## THE JAVAN VIPER.

THIS animal is covered with ſcales of a ſea green colour, and ſurrounded with ſtripes of a dark tawny; running tranſverſely round the body, from the head to the tail. The head is defended with large reddiſh ſcales, with two tranſverſe ſtripes over the eyes. It has a red circle round the neck, and the ſcales on the belly are of a bright yellow, bordered on the ſides with a ſmall black line.

## THE VIPER OF CEYLON.

IT has two ſmall eyes ſeated over the noſtrils, and the appearance of two others, but they are only two whitiſh ſpots over the jaws, that reſemble eyes. The noſe is covered with large black ſcales, which are

are adorned with an undulated black and red ſtreak. The belly is of a bright yellow, ſpotted with red, and furniſhed with whitiſh ſcales.

## THE AMMODYTES OF CEYLON.

THIS is a very large and dangerous ſerpent, and its mouth is furniſhed with a great number of ſharp teeth. The eyes are large and ſparkling, and on the forehead are ſmall round ſcales of various colours; ſome of which are yellow, others red, and others of a mixture of red and black: the body, above and below, is of a whitiſh aſh-colour; and on the back are angular ſpots, variegated with white and brown. The ſcales on the upper part of the body are placed like net work, with large maſhes; and the tail is ſpotted with brown, ending in a bony point.

## THE GERENDA.

THIS ſerpent inhabits the Eaſt-Indies, where divine honours are paid to it. The ſkin is finely ſpotted, and covered with very thin ſcales of a yellowiſh aſh-colour, and encircled with red bands, which appear like ribbands. The head is oblong, reſembling

reſembling that of a hound, and is of a pale aſh-colour: the eyes are lively and ſparkling; the teeth ſmall and ſlender; and the noſtrils large: the tranſverſe ſcales on the belly are of a yellowiſh aſh-colour, and the ſmall ſcales of a bright aſh-colour, ſpotted in the middle with a deep red. This ſerpent generally lies folded up. It is held in the higheſt veneration in Calicut and Japan, but the inhabitants of Malabar are greatly afraid of it.

## THE GIBOYA.

THIS is the largeſt of all the Brazilian ſerpents: Leguat informs us, he has ſeen one fifty feet in length; and we have the concurrent teſtimony of miſſionaries and hiſtorians as a further proof. The largeſt of this kind that has been brought into Europe did not exceed thirty-ſix feet in length. The moſt uſual length, however, of this animal, is about twenty feet, and the thickneſs in proportion. The teeth are very ſmall in proportion to the body, and this ſerpent is without venom. It lies in wait for wild animals near the paths, and when it throws itſelf upon one of them, it winds about it

ſo

ſo cloſely, and with ſo much ſtrength, that it breaks all its bones; then moiſtening the whole body over with its ſlaver, it renders it fit for ſwallowing whole.

## THE BOIGUACU.

THIS ſerpent is the next in magnitude to the Giboya, and has often been ſeen to ſwallow a goat whole. It is thickeſt in the middle of the body, and grows ſhorter and ſmaller towards the head and the tail. A chain of ſmall black ſpots runs along the middle of the back, and extend the whole length of the animal; on each ſide there are large round black ſpots, at ſome diſtance from each other, which are white in the centre. Between theſe, near the belly, are two rows of ſmaller black ſpots, which run parallel to the black. In each jaw it has a double row of ſharp teeth: the head is broad, and there are two prominences over the eyes. This ſerpent has two claws, reſembling thoſe of birds, near the extremity of the tail. It is obſerved by Piſo, that theſe ſerpents lie hid in the thickets, from whence they ſally out unawares, and raiſing themſelves upright on their tails, will attack both men and beaſts. When exaſperated,

exaſperated; they make a loud hiſſing noiſe, and ſometimes dart from the trees upon travellers, and twiſt themſelves ſo cloſely round their bodies, as to diſpatch them in a very few minutes. Condamine, however, makes no mention of this, but he affirms that their bite is not dangerous; for though the teeth are ſo large as to create terror in the mind of the beholder, their bite is not attended with any other conſequence, than what may proceed from an ordinary wound. This ſerpent is called *Cobra de Veado* by the Portugueſe.

## THE AMPHISBÆNA, OR DOUBLE-HEADED SERPENT.

THIS animal is remarkable for moving along with either the head or the tail foremoſt, as the Greek name imports: many authors have therefore affirmed that this ſerpent has two heads; which cannot poſſibly be true, there being no ſuch animal in nature. It is probable that this error took its riſe from the thickneſs of the tail; for this ſerpent is equally thick at each end, and the colour of the ſkin is like that of the earth. It is rough, hard, and variouſly ſpotted.

It

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Rattle Snake
Female Viper

It is an inhabitant of Lybia and the iſland of Lemnos.

## THE DEPONA.

THIS is a very large ſerpent, and is a native of Mexico. The head and jaws are very large: the mouth is armed with cutting crooked teeth. There is a broad ſcaly border round the mouth; and the eyes are ſo large as to give it a very terrible aſpect. The forehead is covered with large ſcales, on which others, which are ſmaller, are curiouſly ranged. Each ſide of the belly is marbled with large ſquare ſpots, of a cheſnut colour, in the middle of which is a round yellow ſpot. This ſerpent avoids the ſight of man, and therefore cannot do much injury.

## THE RATTLE-SNAKE.

THIS ſerpent is bred only in America: the uſual length is from four to five feet, but they are ſometimes ſeen ſix feet in length, and as thick as a man's leg. It reſembles the viper in many particulars: like that animal, it has a large head, and a ſmall neck; it is of a duſky colour, and is furniſhed with fangs ca-

pable of inflicting the moſt terrible wounds. It has a large ſcale, which hangs like a pent-houſe over each eye. The rattle-ſnake is of an orange, tawny, and blackiſh colour on the back; and of an aſh-colour on the belly. The male may be readily diſtinguiſhed from the female, by a black velvet ſpot on the head, and by the head being ſmaller and longer. But what principally diſtinguiſhes this ſerpent is the rattle, an inſtrument lodged in its tail, by which it makes ſuch a loud rattling noiſe when it moves, that its approach may be known, and the danger avoided. This rattle is compoſed of ſeveral thin hard hollow bones, linked to each other, and rattling upon the ſlighteſt motion.

Some have aſſerted that this ſerpent acquires an additional bone every year; from whence its age may be preciſely known: it is certain, however, that ſnakes of only a year or two old have no rattles at all, but ſome old ones have been found with twelve or thirteen joints.

The certain death which accrues from the terrible bite of this creature, makes a ſolitude wherever it is heard. It moves along with majeſtic rapidity; but never unprovoked attacks any thing but its prey;

prey; but when accidentally trod upon, or purſued for its deſtruction, it makes a moſt dreadful and deſperate defence. It erects the tail, throws back the head, and inſtantly inflicts its wound: then parts, and inflicts a ſecond wound; after which, ſome travellers aſſure us, that the animal becomes torpid and inactive, and never even attempts to make its eſcape.

The very inſtant the puncture is made, it is more painful than the ſting of a bee, and this pain grows every moment more excruciating and dangerous: the limb ſwells; the venom reaches the head, which ſwells to an enormous ſize; the eyes are red and fiery; the heart beats quick; the pain becomes inſupportable, and ſome expire under it in five or ſix hours: thoſe of ſtrong conſtitutions may endure the agony a few hours longer, and at laſt ſink under a general mortification.

A gentleman in Virginia trod accidentally upon a rattle-ſnake, which had been lurking in a ſtony place: the enraged animal reared up, bit his hand, and ſhook its rattles. The gentleman, unwilling to die unrevenged, killed the ſnake, and carrying it home in his hand, threw it on the ground before his family,

crying out, "I am killed, and there is my murderer!" His arm, which was beginning to ſwell, was immediately tied up near the ſhoulder, the wound was anointed with oil, and every means employed to ſtop the infection. His arm, below the ligature, appeared of ſeveral colours; all the muſcles were in motion; a fever enſued; after that the loſs of his hair, giddineſs, drought, weakneſs, and nervous faintings; till, by ſlow degrees, a very ſtrong conſtitution overpowered the latent malignity of the poiſon, and he recovered; but not without feeling the moſt various and dreadful ſymptoms for ſeveral weeks afterwards.

Many have affirmed that the rattle-ſnake has the power of charming ſquirrels, hares, birds, and other animals, in ſuch a manner as to make them run directly into its mouth. In Penſylvania, this ſerpent is often ſeen baſking at the foot of a tree. There, coiled upon its tail, its jaws extended, and its eyes ſhining like fire, it levels its dreadful glare upon its prey: the little animal is incapable of breaking through the faſcination, it advances towards the ſerpent with ſeeming reluctance; at length, as if overcome

come by the potency of its fears, it jumps into the throat of its frightful deſtroyer.

The *whip-ſnake* is ſtill more venomous than the rattle-ſnake. It is a native of the Eaſt, and is about five feet in length, though it is not much thicker than the thong of a coachman's whip; from whence it has its name.

The *aſp* is alſo a very formidable ſerpent, but its bite it not attended with thoſe drowſy ſymptoms which the antients aſcribed to it.

The *jaculus* of Jamaica is one of the ſwifteſt of the ſerpent kind.

The *ſeps* inflicts a very venomous wound, and cauſes the part affected to corrupt in a very ſhort time.

The *coral* ſerpent is red, and its wound is ſaid to be fatal.

The *cobra di capello*, or *hooded ſerpent*, inflicts the moſt deadly and incurable wounds: there are five or ſix different kinds of this formidable creature, which are all equally dangerous; a ſpeedy death being the certain conſequence of their bite. It is ſaid the patient will die in about an hour after the wound is given; the whole frame being diſſolved into one putrid maſs of corruption. This animal

is from three to eight feet long, with two large fangs hanging out of the upper jaw.

## THE SNAKE.

THIS is the largeſt of the Engliſh ſerpents, and is ſometimes found upwards of four feet in length: the neck is ſlender; the middle of the body thick; the back and ſides covered with ſmall ſcales; the belly with oblong narrow tranſverſe plates. The back and ſides of the ſnake are of a duſky brown: on the middle of the back are two rows of ſmall black ſpots, extending from the head to the tail; and the ſides are croſſed with multitudes of lines conſiſting of ſpots. The plates on the belly are duſky; the ſcales on the ſides are of a blueiſh white. The teeth are ſmall and ſerrated, lying on each ſide of the jaw in two rows. This ſpecies has a ſpot of pale yellow on each ſide of the neck; it is perfectly inoffenſive, taking ſhelter in dunghills, and among buſhes in moiſt places. It will readily take the water, and ſwims very well, its whole length generally appearing on the ſurface of the water. In ſummer the ſnake is invited out by heat to baſk itſelf in the ſun. If diſturbed, they move ſwiftly

ſwiftly away among the brambles; and, if too cloſely purſued, will hiſs and threaten, and though incapable of offending, will thus render themſelves formidable. The ſnake preys upon frogs, inſects, worms, and mice. During winter it lies torpid under old trees, or in the banks of hedges.

## THE BLIND WORM.

LIKE the ſnake, the blind worm is a very inoffenſive reptile, with a formidable appearance. The uſual length of this ſpecies is about eleven inches; the iris of the eye is red, the head ſmall, the neck very ſlender; the body grows ſuddenly from the neck, and continues of an equal bulk to the tail, which is blunt at the end. The back is aſh-coloured, marked with very ſmall lines compoſed of minute black ſpecks; the ſides are reddiſh, and the belly duſky, marked in the ſame manner as the back. This ſerpent is ſlow in its motions, on which account, (together with the ſmallneſs of its eyes) it obtained its names: ſome calling the *ſlow*, and others the *blind* worm. Like other ſerpents in our climates, it lies torpid during

during winter, and many of them are ſometimes found twiſted together. Like the viper this animal brings forth its young alive. Dr. Borlaſe mentions a blind worm with a pointed tale, by the bite of which a man loſt his life. It is probable that the duſky viper was miſtaken for one of this kind; for it is generally agreed that the viper is the only poiſonous ſerpent in theſe kingdoms.

# INSECTS.

## Of INSECTS in General.

INSECTS may be defined to be little animals without red blood, bones, or cartilages, furniſhed either with a trunk, or a mouth opening lengthwiſe, with eyes which they are incapable of covering, and with lungs which have their openings on the ſides. The whole claſs of inſects is comprehended in this definition.

Swammerdam, Reaumur, and Linnæus, have each endeavoured to abridge the taſk of deſcription, by throwing a number of ſimilar animals into diſtinct claſſes, and thus making one general hiſtory anſwer for all. We ſhall, in ſome degree,

degree, follow their example, and throw the whole claſs of inſects into four ſeparate diſtributions.

The firſt which offer themſelves are thoſe which are deſtitute of wings, that appear crawling about on plants or on the earth. Some of theſe never obtain wings, but creep on the vegetable, or the ſpot of earth where they are ſtationed for their whole lives. Others indeed are candidates for a happier ſituation, and only wait for the growing of their wings, when they may be ſaid to arrive at their ſtate of full perfection. Thoſe which remain without wings, may be conſidered as conſtituting the firſt claſs of infects. All theſe are produced from an egg, the flea and the wood-louſe only excepted; and after they are excluded from the ſhell, they never ſuffer any further change of form: thus the louſe and the ſpider are produced from an egg; and, therefore, like the chicken or the duck, remain entirely the ſame from their birth to their diſſolution.

The ſecond order of inſects are compoſed of ſuch as have wings, but their wings are caſed up in ſuch a manner as not to appear, when produced from the egg. Theſe animals, however, are not prevented

prevented by the caſing up of the wing, from running, leaping, and moving with its uſual celerity; but, when the caſe burſts, the wings expand, all the creatures motions become more extenſive, and it arrives at full perfection. The graſshopper, the dragon fly, and the ear-wig, have their wings at firſt bound down; but when the ſkin burſts they are expanded, and the animal purſues the purpoſes for which it was produced.

The moth or butterfly kind form the third order of inſects. Theſe have four wings, covered with a mealy ſubſtance of various colours, which comes off upon the fingers when they are handled. Theſe are produced in a manner peculiar to themſelves. They are firſt hatched from an egg, from whence proceeds a caterpillar that eats, and often caſts its ſkin: at length it aſſumes a new covering, which is called a chryſalis, in which it remains concealed, till it comes forth a moth or butterfly.

The fourth order of inſects conſiſts of ſuch as have wings, which come from a worm inſtead of a caterpillar, and paſs through changes ſimilar to thoſe of moths and butterflies. They are excluded from the egg as a worm, and then become a chry-

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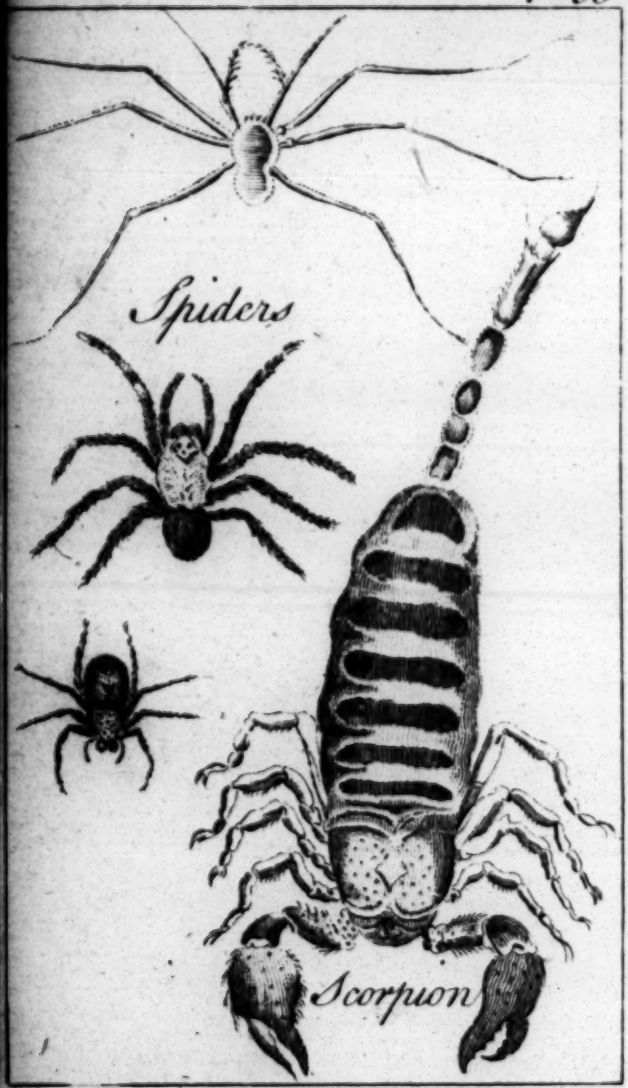
Spiders
Scorpion

ryſalis: at length they burſt their pri-
n, and come out perfect animals, ſome
ing furniſhed with two, and others
ith four wings. Theſe wings, how-
er, are very different from thoſe of the
utterfly and moth kind, as they have
one of thoſe meally particles which are
ways to be found on the wings of the
rmer. The numerous tribe of gnats,
etles, bees, and flies, are comprehend-
l in this claſs.

As a fifth order may be added a nume-
us tribe lately diſcovered, called zoo-
hytes by the naturaliſts. Theſe do not
o through the ordinary forms of gene-
on, but may be propagated by diſſec-
on. If ſome are cut into an hundred
arts, each part retains life, and is en-
ued with ſuch a vivacious principle, that
will in a ſhort time become a perfect
nimal. To this claſs belong the poly-
us, the earth-worm, and all the varie-
es of the ſea-nettle.

## THE SPIDER.

THE moſt ſubtle of all inſects is the
ider. Formed for a life of rapacity,
l its habits are calculated to deceive and
rprize. In this iſland, where all the
inſect

inſect tribes are kept under by huma
aſſiduity, the ſpiders are ſmall and ino
fenſive. The chief of our native ſpide
are the *houſe*-ſpider, which weaves i
web in neglected rooms; the *garden-ſp*
*der*, which extends its web from tree
tree, and repoſes in the center; the *wa*
*dering ſpider* that has no fixed abode, an
the *field ſpider*, which ſometimes moun
web and all into the clouds. Theſe a
all reputed venomous, but they are pe
fectly harmleſs. In Africa and Americ
the tribe of ſpiders are much more terr
ble. The bottom of a Martinico ſpide
body is as large as a hen's egg, and co
vered with hair; its web is ſtrong, an
its bite is dangerous. We are happi
placed at a diſtance from theſe formidab
creatures, and are ſatisfied with the hi
tory of them, without wiſhing to ap
proach them.

Every ſpider has two diviſions in i
body; the fore-part contains the hea
and the breaſt, and is ſeparated from th
belly or hinder part, by a very ſlend
thread, which however forms a conne
tion between the two parts. The for
part is furniſhed with a hard ſhell, a
well as the legs, which adhere to th
breaſt. They have brilliant eyes a
roun

round the head; ſome are poſſeſſed of eight, and others only ſix; two are placed before, two behind, and the reſt on each ſide. As theſe animals procure their ſubſiſtance by the moſt watchful attention, ſo many eyes are neceſſary to give it the earlieſt information of the capture of its prey. On the fore-part of the head they have two pincers ſtrong pointed, and ſerrated, and terminating in claws. A ſmall hole is ſeen below the point of the claw, thro' which it emits a poiſon, which, though harmleſs to us, inſtantly deſtroys their prey. They have all eight legs, jointed like thoſe of lobſters, and, like them, if a joint is loſt, they are quickly ſupplied with a new one. Beſides the eight legs already mentioned, ſpiders are furniſhed with two others, which may not improperly be called arms, as they do not ſerve to aſſiſt motion, but are uſed in managing their prey.

As the ſpider lives wholly upon flies, and is deſtitute of wings to purſue them, it becomes an experienced hunter, and ſpreads a net to catch thoſe animals it is unable to purſue. Its web is generally laid in thoſe places where flies uſually reſort: there it remains in patient expec-

tation for days and weeks together, ſeldom changing its ſituation.

To fabricate this web, Nature has ſupplied the ſpider with a large quantity of glutinous matter within its body, and five teats for ſpinning it into thread. The threads which we ſee ſpun from theſe teats, and which appear ſo fine, are nevertheleſs compoſed of five joined together, and theſe are many times doubled when the web is in formation.

The female ſpider generally lays from nine hundred to a thouſand eggs in a ſeaſon; they are of a blueiſh colour, ſpeckled with black, and are large or ſmall, in proportion to the ſize of the animal that produces them. An hour or two after the excluſion of the eggs, the female prepares to make them a bag, where they are to be hatched. For this purpoſe ſhe ſpins a web much ſtronger than that made for catching flies, and lines it with a down which ſhe plucks from her own breaſt. Within this ſhe depoſits the eggs, and ſticks it to the end of her body by means of her glutinous fluid: thus loaded, the animal appears as if ſhe had one body placed behind another, and this treaſure ſhe ſeldom abandons but with her life.

When

When the young are excluded from their ſhells, the female bites open their priſon, and ſets them free; ſhe then receives them upon her back till they have ſtrength to provide for themſelves.

Of this animal there are ſeveral ſlightly differing from each other, either in habits or conformation, but varying conſiderably in ſize. The *Bermudas ſpiders* are of a very large kind. The *ſtreaked ſpider* is ſpeckled with black all over its body and legs. The *Carter*, or long-legged ſpider, has legs of an extraordinary length, and there is no diſtinction of the back and belly part; for the whole body appears to be nearly round.

## THE TARANTULA.

THIS animal has ſome reſemblance to the houſe ſpider; but is the largeſt yet known in Europe. It is a native of that part of Italy called Apulia. The body is about three quarters of an inch in length, and about the thickneſs of a man's little finger: it is generally of an olive brown, variegated with a duſky colour: it has eight legs, eight eyes, and ſharp nippers: between theſe and the fore-legs, there are two little horns or

feelers, which it moves very briskly when it approaches its prey. Its body is covered with a kind of ſoft down, and it propagates, like other ſpiders, by laying eggs. In the ſummer months, the tarantula creeps along the corn, and bites the paſſengers and mowers; but in winter it lurks in holes, and is very ſeldom ſeen. Though the bite of this animal is attended with no dangerous ſymptoms, and will eaſily cure of itſelf, wonderful ſtories are reported concerning its virulence. The perſon bit, it is ſaid does nothing but laugh, dance, and ſkip about, putting himſelf into the moſt extravagant poſtures; this is ſucceeded by a moſt frightful melancholy, and at length the ſymptoms terminate in death. Some travellers into Italy affirm, that this extraordinary malady is only to be cured by muſic, and particularly by the violin. The medical muſician begins with a particular tune, celebrated for the cure: the patient begins to dance, and continues dancing till he is all over in a ſtrong perſpiration, which forces out the venom that appeared ſo dangerous. Swammerdam, however, aſſures us, that even in Apulia, this ſtory is looked upon as entirely fabulous, and is kept up as a vul-

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gar error by ſome ſtrolling muſicians, who obtain a livelihood by playing the ſuppoſed venom away.

## *The* FLEA.

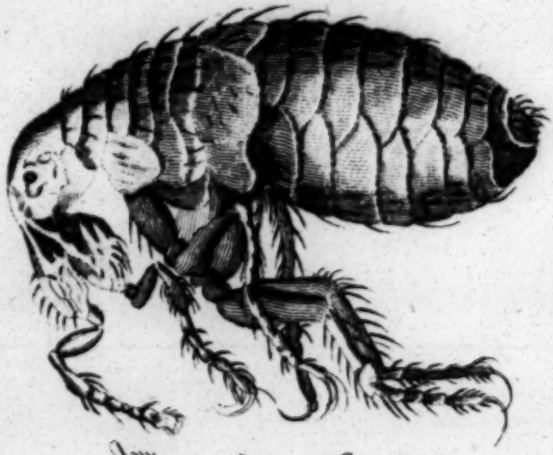
Very few are ignorant of the agility and blood-thirſty diſpoſition of the flea. It is not only the enemy of mankind, but of the dog, cat, and ſeveral other animals, and is found in every part of the world. The flea has a ſmall head, large eyes, and a roundiſh body. It has feelers, or horns, which are ſhort, and compoſed of four joints; between which its trunk is ſituated, which it buries in the ſkin, and through which it ſucks the blood in large quantities. When beheld through a microſcope, it appears to be curiouſly adorned with a ſuit of poliſhed ſable armour, elegantly jointed, and beſet with great numbers of ſharp pins, reſembling the quills of a porcupine. It has a piercing round black eye: it is furniſhed with ſix legs, which are ſo contrived, that it can fold them up one within another, and, when it leaps, they all ſpring out at once; whereby its whole ſtrength is exerted, and it can raiſe itſelf to an extraordinary height.

## THE LOUSE.

THE louſe is the enemy of man in the moſt odious degree; for whether wretchedneſs, diſeaſe, or hunger ſeize upon him, the louſe ſeldom fails to add itſelf to the tribe, and to encreaſe in proportion to the number of his calamities. In examining the louſe with a microſcope, its external deformity ſtrikes us with diſguſt; but as the learned and elaborate Dr. Swammerdam has given us a very minute deſcription of this inſect, we cannot withhold it from our readers, though we wiſh it had been leſs ſcientific and leſs prolix. It is, however, exceedingly curious and entertaining.

Before I exhibit, ſays he, the internal parts viſible in this ſmall and deſpiſed animal, I ſhall deſcribe its external parts, and ſhall ſhew every thing remarkable in the head, thorax and abdomen. The ſhape of the fore part of the head is ſomewhat oblong, that of the hind part ſomewhat round; the ſkin is hard, and being ſtretched, is tranſparent like parchment, and has here and there briſtly hairs. At the extremity of the fore part is the proboſcis, or ſucker, ſeldom viſible, ſince it

Flea



Louse

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it is always drawn to the inſide; I ſhall therefore deſcribe it when I come to the throat and ſtomach. On each ſide of the head are the antennæ or horns, which are alſo covered with a ſkin like parchment. Each of theſe is divided into five joints, elegantly covered with briſtly hair, and ſeveral white veſſels are ſeen through theſe horns. Behind theſe are the eyes, which ſeem to want thoſe hexagonal diviſions obſervable in other inſects, and they appear to be encompaſſed with ſome few hairs.

The neck is very ſhort, the breaſt is divided, as it were, into three parts; in the middle of which, on the back ſide, appears, as it were, a ſmall ſhield. On each ſide are placed ſix legs, each of which conſiſts of ſix joints, ſome larger than others: they are very delicately adorned with briſtly hairs, and many whitiſh veſſels are ſeen through them. The ends of their legs are armed with a ſmaller and larger ruddy and pellucid claws, ſerving theſe inſects inſtead of a finger and thumb; for by the former they take hold of a perſon's hair, and by the latter, they are able to aſcend and run nimbly. Under, at, and upon the breaſt, where it is joined to the legs, and, as it were

were in the very centre of it, there appears a ſhort whitiſh groove or channel, which is conſpicuous through the middle of the abdomen, appears of a browniſh colour, and has very ſtrong motions. On either ſide of this groove or channel are two bright little parts, like the larger before deſcribed, whoſe appendages they are, and which riſe conſiderably on the inſide of the breaſt, and are there alſo tranſparent.

The abdomen is divided into ſix parts, and at the end of it, on the under part, the body terminates as it were in a cloven tail. Beſides theſe in the middle of the lower part of the belly, there is to be obſerved a whitiſh ſpot like a point, which is alſo tranſparent, and moves diſtinctly up and down. On the ſides and extremities of the belly, which is all over hairy, are obſerved ſome pellucid, ruddy, little bodies; and over the whole belly, a great number of white veſſels are viſible. The like are diſcernable in the back and breaſt. The ſkin of the abdomen is made like the ends of our fingers, conſiſting of ſmall grooves, but this ſtructure does not hold through the whole, and not at all at the extremities of the abdomen; for there, as well as in the whole body,

body, it is ſomewhat firm, like clear parchment, and when roughly preſſed, it makes a noiſe and breaks.

To obtain a perfect knowledge of all thoſe parts, which I have hitherto mentioned in general, there is no other method than to diſſect the creature. I ſhall therefore now give an exact deſcription of all the minutiæ relating to the internal parts; for by this means we ſhall have a compleat idea of the external alſo.

If we begin the diſſection in the upper part of the abdomen, and cautiouſly open the ſkin there, blood immediately iſſues from the wound, and this being received into a ſmall glaſs tube, and viewed with a powerful microſcope, is ſeen to conſiſt of tranſparent globules, as cows milk: the ſame has been likewiſe diſcovered in the human blood for ſeveral years; it is found to conſiſt of ruddy globules ſwimming in a clear liquor.

It is, however, a matter of doubt, whether the blood in its veſſels has any globules, for when drawn from them it may eaſily acquire that figure; this may at leaſt be aſſerted of the ruddy part of the blood. I have therefore often reſolved to put a ſmall glaſs tube into the artery of a dog, and with a microſcope to view the

the flowing blood. For thus, by analogy, it may be poſſible to determine with ſome certainty, whether the human blood, before it is taken out of its veſſels, contains any globules. I am the more in doubt concerning this matter, becauſe there are veſſels diſcovered in the body, which appear much finer than the globules themſelves viſible in the blood. By this means alſo may be known the true difference between the arterial and venal blood; for in the latter only, I have hitherto obſerved theſe globules, having never examined the former: nor ſhall I poſitively aſſert, that there are original globules in the louſe's blood, for they may be eaſily formed by the intermixture of the blood with the fat, and ſome wounded particles of the viſcera or bowels, which conſiſt of a congeries or heap as it were, of globular parts; as I ſhall ſhew in its proper place. Wherefore, more time ought to be ſpent in this anatomy, than I can devote to it at preſent, being engaged in many other ſtudies.

Immediately under the ſkin are certain muſcular fibres, which move the annular diviſions of the abdomen. I have obſerved three diſtinct kinds of theſe muſcles, ſome a little broader, others narrower,

rower, and a third ſort with two bodies. One may ſee that theſe muſcles extend themſelves from one annular diviſion to another, and that ſome are much ſhorter than others. This little animal is very full of muſcles, particularly at the extremities of the abdomen; ſince the motion is ſtrongeſt in that place, and the reſpiratory points, or orifices for reſpiration are placed there; by the aſſiſtance of which the louſe takes in the air, and by a manifeſt act of inſpiration and expiration, draws it into the body, and again diſcharges it. When theſe muſcles are drawn from the body, they ſeem as if they conſiſted of but one fibre, but if they are dried upon a thin and clear glaſs, and waſhed with ſpirits of wine, which takes off the impure fat that adheres to them, their fibres and joints appear diſtinctly to be made up of globules.

Under theſe muſcles the fat and the trachiæ, or air-veſſels, come in view; nor could I ever hitherto diſcover any veſtige of a heart in this upper part of the abdomen, as is uſual in other inſects, wherein the heart is always placed in this upper part of the abdomen and back; but I found clearly by this diſſection, that the louſe otherwiſe agrees

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in all its parts with other inſects, as will hereafter plainly appear; therefore I have more diligently ſought for the heart, but in vain: this may probably be owing to its extreme ſmallneſs, ſince it is very difficult to find it in the larger inſects, as in the houſe fly. There is alſo another impediment, which is, the ſtrong and continual agitation of the ſtomach in this inſect, being hardly a moment at reſt; from which there ariſes an unavoidable inconvenience in inveſtigating the heart.

The particles which I take to be the fat of the louſe, are for the moſt part very ſmall, but extremely numerous, though we may diſcover it in a larger ſpecies or kind of fat particles; the figure of the ſmalleſt kind of particles is uſually globular, but that of the greater is more irregular. They are of a clear tranſparent colour, like jelly; but all the other parts of this animal are not of that colour.

The ramifications of the trachea, aſpera arteria, or wind-pipe, conſtitute the principal part of this inſect; a very conſiderable number of them are found in the head, breaſt, belly, legs; nay, and in the antennæ or horns. We may

like

likewiſe obſerve, that they are connected and ſupported by the fat, as I have found in other inſects: and theſe are the white veſſels, which are ſeen though the tranſparent body, as I have obſerved in the hiſtory of the external parts. The reaſon that theſe pulmonary pipes are ſeen through the ſkin, is, that they are of a ſilver colour, or light bright mother-of-pearl, and therefore afford a very agreeable ſight, whilſt the animal lives. They conſtantly keep this colour, nor will they ever fade, for their ſtructure is ſuch, that they remain always open.

As to their compoſition, it conſiſts of a double matter; a part is compoſed of rings, which reſemble the cartilages of the trachea, or wind-pipe, in man. It appears very diſtinctly by the microſcope, that theſe rings often bend themſelves round, in order to form a cavity and open pipe, but this does not happen ſo often as in other inſects, becauſe the rings of the louſe are ſhorter: they are alſo more curled and twined, in the likeneſs of a ſerpent, and ſeem every where interrupted. It may alſo be obſerved, that where the aſpera arteria, or wind-pipe, is divided into branches, theſe rings are largeſt, but they are afterwards in-

ſenſibly divided into ſmaller. The other part of theſe veſſels is membranaceous, and is ſituated in the interſtices of thoſe rings; and by its aſſiſtance the rings may conveniently bend and turn themſelves, as is known to happen, particularly in thoſe wonderful motions of the ſtomach, which is ſurrounded by a great number of air-pipes.

I have hitherto omitted examining whether theſe pulmonary pipes within the body, likewiſe ſhed a little ſkin at the time the louſe caſts its coat, as I have obſerved to have happened in the bombyx, or ſilk-worm, and in almoſt all other inſects. However, the ſmaller theſe pulmonary pipes are, the fewer rings they have, until at length they appear like more membranaceous threads.

I may venture to affirm, that the pulmonary pipes cannot be more conveniently viewed in any ſpecies of animals that I have hitherto known, without diſſection, ſo that we cannot contemplate their ſituation and courſe, with greater admiration, in any animal than in the louſe. But I have by me a very curious and famous apparatus, by the aſſiſtance of which, I can at any time demonſtrate it with the greateſt certainty.

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The orifices of the pulmonary pipes are ſeen in the outward ſkin of the louſe; one of which is on either ſide of the breaſt; and on each ſide, on the extremities of the abdomen are placed ſix. I have alſo thought I ſometimes ſaw one pair of air orifices between the ſecond and third pair of legs; however, I will not be poſitive in this matter. Theſe orifices are the reſpiratory points, one of which is ſituated on one ſide, between the firſt and ſecond pair of legs, and ſix on the extremity of the belly; theſe points ſwell a little there, like a ſmall nipple, and in their circumference, ſeem to have a ſlight rim or border, which appears ſomewhat ruddy and tranſparent, as the place itſelf wherein they are fixed is alſo of a light red and bright colour; they are a little bent towards the inſide, and immediately after the tegument of the extremity of the abdomen ſwells out. All the joints are like that which I have obſerved to be placed in the breaſt.

From every reſpiratory point there iſſues a branch of the trachea, which ſoon after forms a viſible anaſtamaſis or inoſculation with ſome branch of the trachea, that proceeds from another point, and both cloſe into one canal: the ſame holds

alſo in all the fourteen apertures of the lungs; ſo that the air, which is drawn into the body by one reſpiratory point, may be ſpread through the whole. Nor is it there only that the pulmonary pipes unite, but this holds equally in thoſe which are in the back, belly, and breaſt; which laſt is diſtinguiſhed by three manifeſt ramifications that are joined together underneath. This matter hath been already elegantly delineated by doctor Hooke, in his incomparable micography; however, he could have no knowledge of theſe ramifications by any other means, but that they appear viſible through the body.

I am further inſtructed by the diſſection, that the pulmonary pipes may be diſcovered not only in the head, breaſt, and abdomen, but they reach alſo to the inteſtines, the ovary, ſpinal marrow, brain, and, in fine, to all the internal parts of the body of this animal; all which, as I have diſtinctly ſeen, ſo I can demonſtrate them to others, with the aſſiſtance of certain experiments which God enabled me to invent in the ſtudy of anatomy, that the miracles of his works might be known: for we have not even the leaſt thing from ourſelves, for it is God that giveth us ingenuity.

Theſe

Theſe things being well underſtood, I might proceed to deſcribe the other parts, as firſt, the ovary, which appears next after the former, being a part placed upon the ſtomach itſelf: but ſince method requires us to treat, before theſe, of thoſe parts which aſſiſt digeſtion, and tend to the nouriſhment and preſervation of the body, and afterwards of thoſe which ſerve for generation. I ſhall now deſcribe the proboſcis, or ſucker, the throat, ſtomach, inteſtines, and other adjacent parts. I ſhall after theſe treat of the ovary, brain, and nerves, and then add ſomething concerning the outward ſkin, with which I ſhall conclude this anatomical deſcription.

The louſe has neither beak, teeth, nor any kind of mouth, as doctor Hooke deſcribed it, for the entrance into the gullet is abſolutely cloſed: in the place of all theſe, it has a proboſcis or trunk, or, as it may be otherwiſe called, a pointed and hollow aculeus or ſucker, with which it pierces the ſkin, and ſucks the human blood, taking it for its food into the body. But this proboſcis cannot be ſhewn, on account of its extreme ſmallneſs; nor can it be diſtinguiſhed,

unleſs a perſon happens to ſee it by chance.

At the extreme point of the head, when preſſed out artificially, and with a particular attention, there appears an obtuſe prominence, which being hollow in the middle of the inſide, bends back into itſelf, and goes into the body, but has no aperture or opening. From this the proboſcis, or ſucker, is obſerved ſometimes to proceed, and wherefore this part is, as it were, the ſheath or caſe of it, wherein it is laid up.

I cannot illuſtrate this ſtructure or machinery by a more proper example, than by that of the horn of a ſnail, which is likewiſe turned into itſelf on the inſide, and is again ſtretched out, but there is no perforation: wherefore, if the proboſcis or ſucker was placed at the end of it in this inſect, inſtead of the real eye which we ſee in the ſnail; one might in ſome meaſure form an idea how the proboſcis, or ſucker, is wrought in this inſect, and worked up with admirable art by the ſupreme architect of the univerſe.

If the whole little ſheath or caſe be afterwards examined, it is obſervable, that the upper end of it is thicker than the lower, and is ſwollen like a muſh-

room;

room; ſo that it appears from hence, that the little foot on which it ſtands is ſmaller than its top. When one preſſes the proboſcis, or ſucker, and its ſheath on the outſide, we ſhall find that the end of the latter is abſolutely blunt, and reſembles the head of a pollard willow tree, having all its branches cut off; we ſee alſo that there are here and there certain pointed parts or claws in it, which, as well as the ſheath, and the proboſcis or ſucker, are of a light-brown colour, and are tranſparent. I ſhall preſently ſhew the uſe of theſe claws; there is alſo a crooked proboſcis or ſucker in the middle of them. The outward ſkin of the ſheath which is annexed to the proboſcis, and from which its head is promiment, is of the ſame texture with the reſt of the ſkin that covers the louſe; for it conſiſts of grooves and pellucid globules, as I ſhall explain hereafter, when I treat of the ſkin.

If we examine that part of a louſe's head at the time when it is ſeeking out ſome pore of ſweat in the hand, wherein to fix its proboſcis or ſucker, a ſmall line of a pale brown colour is then preſented to us, which appears viſible through the head, and has its fore part more deeply coloured.

coloured. This little line is nothing elſe but the ſheath itſelf, with the proboſcis hidden in the inſide.

But before I explain the uſe of this proboſcis or ſucker, and its manner of riſing, its ſeems neceſſary to deſcribe the figure, ſituation, colour, texture and motion of the gullet, ſtomach, and inteſtines: for thus the method, whereby the proboſcis performs its ſuction, will be more eaſily underſtood. The œſophagus or throat is a very ſmall canal, which one cannot ſee at any other time, but when the blood aſcends through the proboſcis or ſucker into the mouth, and paſſes through this into the ſtomach. It is ſituated a little behind the eyes, and ſeems to be carried up above the brain: the reaſon that I think ſo is, becauſe it appears there very clearly at the time of ſuction; ſo that it probably runs immediately under the ſkin of the head. In the neck it is ſomewhat enlarged, and afterwards it grows ſmall again in the back, until it terminates in the ſtomach, near which I have obſerved it, like a very ſmall, clear, and tranſparent thread, wherein a perſon that diſſects it ſometimes obſerves blood, and ſome other ſubſtance, which appears like the contents

tents of the ſtomach. I diſcovered the whole gullet, in the action of ſucking, as before deſcribed; for it is a very difficult matter to diſcover it in any other manner, becauſe in the upper part of the back, and alſo in the head and neck, it is very ſtrongly connected with the adjacent parts.

The ſtomach is lodged partly in the breaſt and back, but the greateſt portion of it is in the abdomen. When ſwollen with blood, it appears of a dark brown colour; which is viſible through the ſkin, and is either a faint red, or a full or bright brown, as the contents of the ſtomach are more or leſs changed. Where the ſtomach joins the breaſt above, its figure reſembles a fork with two teeth; theſe are two hidden appendages of the ſtomach, which go deep into the breaſt, and on either ſide near the gullet and ſpinal marrow, and reach to the firſt pair of legs. Theſe are thoſe two blackiſh, tranſparent and coloured parts, which I have mentioned in general in the hiſtory of the external parts.

The part of the ſtomach connected with the abdomen deſerves particular conſideration; it is formed like an oblong bag, which is here and there continually

tinually contracted and again extended. When it is empty, it is colourleſs, and the ſtomach and its appendages are tranſparent. But as the ſtomach fills, the colour is ſeen plainly through the outward ſkin. It manifeſtly conſiſts of two coats, the outward is thicker, the inner very thin, as it is in all inſects. Nay, it is probable that it has three coats, and that the third is muſcular.

The outward coat of the ſtomach is furniſhed with ſo great a number of pulmonary pipes as can hardly be expreſſed in words. The longer branches are very conſpicuous in it, but the ſmalleſt cannot be diſcovered, except by the aſſiſtance of the beſt microſcopes. On the contrary, the inward coat is very thin; the third, which, I ſuppoſe to be ſituated between the two former, comprehends, without doubt, the muſcular fibres of the ſtomach, by the help of which it performs its wonderful motions. The coats of the ſtomach, eſpecially the outmoſt, appear to conſiſt of very many globular little grains, which are very irregular in form; but whether theſe little grains properly belong to the texture of the ſtomach, or whether they are rather particles of the fat, which cover the ſtomach,

mach, whereby the pulmonary pipes are gently moved, I could not well diſcern; only this I know, that the greateſt part of them, when often touched, retire from the ſtomach.

Underneath, in the abdomen, on a little riſing or prominence, nearly in the middle of the ſtomach, there is ſeen a certain little part, which doctor Hook apprehends may be the liver; but I ſhould rather take it to be the pancreas, or ſweetbread, though there want ſufficient arguments to prove it. Its colour is not properly whitiſh, but ſomewhat inclining to yellow; and it is ſo ſtrongly connected with the ſtomach, that it cannot be eaſily ſeparated from it. If this be laid before the microſcope, it may eaſily be divided into many little grains like glands, but theſe are not very tranſparent. When it is accurately viewed by the microſcope, the pulmonary pipes alſo appear in it. The ſubſtance of this little part is more firm than that of the reſt, for when it is extracted from the body and dried, it is but little diminiſhed. It is of a very irregular figure, and is formed divers ways in almoſt every louſe, being ſometimes greater and ſometimes leſs; but it is always finiſhed in the ſame general

neral manner, by reaſon of its bendings and ſituation over the ſtomach.

At the lower region of the ſtomach is ſeen the pylorus, and immediately from this, the inteſtinum tenue, or ſmall gut, which is extended on each ſide, and formed like the ſtomach: this is alſo provided with a great many pulmonary pipes. At the end of this ſmall gut, which is for the greateſt part bent in a ſerpentine manner, or like the letter S, are diſcovered four ſmall veſſels, which the ſagacious and excellent anatomiſt Marcellus Malpighius, has called the ſwollen veſſels in ſilk-worms; but theſe are ſtraighter and leſs inflected than the louſe; they are conſiderably long, and of the ſame texture with the inteſtines. Theſe four little veſſels are properly four inteſtina cœca, or blind guts, which I have found in all inſects; wherefore, by inference, I call them here by this name, though I never have had the fortune to ſee their extremities. They open into the inteſtine, from whence they ariſe at the place juſt mentioned. After theſe appears the little inteſtine colon, and at the end of that, there is a manifeſt dilatation or extention, which is the cloaca, or place where the excrements acquire their figure;

gure; for they are very irregular, and not like thoſe of other inſects, which are uſually formed in a ſingular and regular manner. Within this dilatation appears the inteſtinum rectum, which ſhews its aperture, as the anus ſituated upon the belly between the diviſion of the tail; and juſt under this the ſkin is very briſtly.

As to the motion of the ſtomach, it is truly admirable; inſomuch that one might ſuppoſe it an animal within an animal, by reaſon of the ſtrong agitations, contractions, dilatations, corrugations, and expanſions, all which belong to it, and ſtrike one with amazement, the whole being plainly ſeen through the body. Theſe appear plainly at the time when the ſtomach is full of food, but they are beſt of all ſeen, when the blood paſſes into it at the time of ſucking; for then it is ſometimes obſerved, that the remainder of the old aliment is mixed with the new, and is ſhaken and agitated up and down, and on every ſide, in the ſtomach. This may be ſeen the more diſtinctly, as the colour of the contents is more dark.

Hence one may eaſily conceive what ſtrange changes and emotions the pulmo-

nary pipes on the ſtomach undergo at that time, and after what various ways the air contained in them is preſſed, moved, propelled, and ſo purified; changed from its firſt nature, and rarified within the creature. But who can diſcover, by the moſt diligent reſearches, the uſe of the air in that place? ſurely no one. Yet, very wonderful motions are obſerved on this occaſion, particularly in that little part which I called the pancreas or ſweet-bread; for this being connected with the ſtomach, muſt obey all its motions. Theſe motions are continually repeated by turns, and undergo an infinite number of variations.

As to the method whereby the louſe ſucks the blood, and conveys that nouriſhment into the ſtomach, it is performed thus, by the aſſiſtance of the proboſcis, and its aculeus or point. Firſt, if the louſe has abſtained from food two or three days, it becomes very hungry, which is diſcoverable from the empty ſtomach, and becauſe the creature is then wholly tranſparent; in this caſe, immediately as ſoon as he is placed on the hand, he ſeeks for food, which he will the ſooner and more readily find, if the hand be firſt rubbed until it grows red.

red. Then the louſe turns its head, which lies between the two fore-legs, to the ſkin, and diligently ſearches for ſome pore of ſweat: when he finds it, he fixes his aculeus or ſucker therein; a little after this, the blood is obſerved, thro' the microſcope, to aſcend to the head, in a very rapid, and, as it were, frightful ſtream.

The louſe has at that time matter enough to feed on in any paſture; for if it finds any hairs on the hand, by which it does not deſire to deſcend, it ſtays in that paſture, and ſucks with its head down, and its tail elevated. I have likewiſe obſerved, that it ſometimes ſucked with its belly upward, that is, when the hair it took hold of was bent down; and then the motion of the ſtomach, and pancreas or ſweet-bread, might be ſeen moſt beautifully by the help of a microſcope.

But I ſhould think the principal uſe of the claws, which I have deſcribed to be ſituated at the end of the ſheath or caſe of the aculeus or ſucker, is to aſſiſt the creature in ſucking, and that the aculeus ſerves for this purpoſe; for whilſt theſe are ſtrongly fixed in the ſuperficies of the inner ſkin, and in the extremities

of the pores, they enable the louſe to uſe its aculeus the more freely, and to move it at diſcretion, when the end of its ſheath is placed firm and immoveable.

Sometimes, whilſt the louſe was ſucking, I have ſtrongly pulled the ſkin of my hand aſide, that by this means the ſheath, or rather its claws, together with the aculeus or ſucker, might be bound faſt in the ſkin, and the louſe could not diſengage itſelf. This affords indeed a very agreeable ſight. This I did with a deſign, that if I could thruſt the louſe out of its place, I might the more plainly ſee the aculeus: but I could never accompliſh my deſire in this particular, tho' I had then almoſt wiſhed to have three hands, that I might the better find what I wanted. There are ſome ſpeculations and reſearches in anatomy that will not bear writing, ſince they almoſt diſtract the mind.

When the louſe is employed in ſucking, a very ſmall rivulet of blood immediately appears behind the aculeus or ſucker, which is ſeen through the tranſparent head. Between and before its eyes, on the middle of the head, there is obſerved alſo a conſiderable dilatation, for the jaws are there remarkably expanded,

panded, by the blood continually aſcending. Theſe parts are ſo ſwiftly contracted again, that there ſcarce remains the leaſt ſign of blood after a moment, and both are performed with ſuch velocity, that the dilatation can hardly be diſtinguiſhed from the contraction; wherefore I do not know how to explain this matter more properly, than by the ſudden oſcillation of the pendulum of a clock. Behind the eyes, a ſmall rivulet of blood is likewiſe obſerved to run down within the head: this paſſage may be properly called the œſophagus or gullet, which lies behind the jaws, and grows wide again in the louſe's neck, as has been ſhewn before. I have choſen to exhibit all theſe as one continued canal, that my deſcription may be the more clear.

After the blood has aſcended to the jaws, and comes to the gullet, we obſerve that it is immediately conveyed to the ſtomach, and that the bifurcated appendages, as well as the ſtomach itſelf, are at once filled with it. The motions of the ſtomach are then remarkably increaſed, its muſcular parts being diſtended; for as theſe muſcular parts are then ſtretched, they have an opportunity of

contracting themſelves again. Wherefore it is immediately obſerved, that the excrements in the large guts begin likewiſe to move; nay, it uſually happens, that the louſe diſcharges them during the ſucking.

The food being thus received into the ſtomach, is agitated about in a wonderful manner; it is moved up and down, and by contractions and dilatations, which are not to be deſcribed, then performed by the ſtomach, is, as it were, ſifted. After this, it is ſeen, that the contents firſt begin to divide into parts in the back or hinder portion of the ſtomach, and they then appear like raiſins preſerved in jars, and are thus diſtributed thro' the body. However, this is a falſe appearance; it ariſes from hence, that the ſkin being divided into many grooves, is not equally tranſparent every where, and that ſome difference is in this reſpect ſeen thro' it, becauſe the grooves are not equally tranſparent with the intermediate parts. Nay, the particles of the internal fat not being uniformly viſible through the ſkin, and obſcuring the brightneſs of the ſkin, conduce likewiſe to deceive the ſight, as if the retreating blood entered into many peculiar veſſels. To this may be added,

added, that the blood has not at that time a homogeneous or equal colour, for its parts ſeparate from each other. From theſe appearances, before I had accurately examined things, I thought that the blood was diſtributed out of the ſtomach, through various veſſels, into the other parts of the body; but I afterwards obſerved that the phenomenon aroſe, as well from the blood itſelf, as from the different colours of the parts through which it was ſeen, and which I then took to be veſſels. Perhaps others, eſpecially Dr. Hooke, who firſt prejudiced me in favour of this opinion, have ſplit on the ſame rock. I have not as yet made this experiment in the ſmalleſt lice, in which more peculiarities may probably be ſeen, than in the larger kind.

I have likewiſe reſolved to receive the blood, when changed in the ſtomach, into a glaſs tube, and then to view it in the open air, or in ſome dark place by candle light; but this I have not hitherto done, being hindered from making this, as well as many other experiments which I had a mind to try. In ſome hours after feeding, the contents of the ſtomach are obſerved to become inſenſibly more brown or blackiſh, and to diminiſh

miniſh ſlowly; wherefore the inteſtines are afterwards ſeen to be more and more diſtended with excrements, which ſometimes lie in them regularly divided, as it were, into globules. The reaſon of this is, that the inteſtines do not, at one and the ſame time, contract themſelves about the fœces, and therefore they caſt or extrude them out of the body at different times. I have already treated of the muſcles of the abdomen in this inſect, I ſhall now proceed to the parts of the breaſt.

In this part, and in the back, are ſeen ſeveral muſcles, which move the legs and head; and herein are alſo viſible the appendages of the ſtomach, and a great number of pulmonary pipes and particles of fat. In the ſame view is alſo ſeen the gullet and ſpinal marrow, together with the nerves ariſing from thence, of which I ſhall now ſpeak diſtinctly.

In the middle of the back is ſeen a certain tendinous point, under the ſmall ſhield there ſituated, where the ſkin does not appear to be ſo tranſparent as in the reſt of the body. This ſhield ſeems there to be hollow, being thruſt down into a little pit. At this point almoſt all the muſcular fibres are ſeen to concur,

cur, and their motion and contraction are here very viſible. As to the appendages of the ſtomach, and other parts of the breaſt and back, we have before treated of them at large.

The ſpinal marrow is properly ſituated in the breaſt, and therein reaches to the inſertion of the laſt pair of legs. When this is diſcovered, it is eaſy to judge what that ſhort whitiſh groove is, which appears through the breaſt, between the appendages of the ſtomach; for theſe appendages are placed on both ſides of the ſpinal marrow. The ſtructure of the ſpinal marrow itſelf, does not differ much from that found in the worm, from which the Scarabœus Naſicornis, or Horned Beetle, by the ancients conſecrated to Mercury, is produced, as is manifeſt from the hiſtory and figures of the latter. It conſiſts of three remarkable ſwellings, expanſions, or dilatations, from which, on either ſide, we obſerve three nerves to ariſe, which reach to the muſcles of the ſix legs; but underneath, or in the hinder part of it, I diſtinguiſhed ſix nerves iſſuing, which doubtleſs are diſtributed through the reſt of the viſcera, to give them life, ſenſe and motion. The loweſt of thoſe little knots, whereof the

ſpiral

ſpinal marrow is compoſed, is formed in a different manner from the upper ones, which are alike. The membrane which covers the marrow is interwoven with a great many pulmonary pipes, and ſeems to be compoſed of irregular and globular little parts, in the ſame manner as we have ſhewn in reſpect of the coat and ſtomach; and this texture, together with the great number of pulmonary pipes belonging to the part, afford a very agreeable ſight in the living inſect.

I could diſcover no fibres in the nerves, which ariſe from the poſterior part of the marrow, though I viewed them freſh with the microſcope; they ſeemed indeed to be made up of a homogeneous, bright and tranſparent matter, and at their ſides were hung a great many pulmonary pipes, with particles of fat. The origin of the marrow, where it is connected with the brain, is ſeen like a fine thread. But in all other inſects this beginning of the marrow is perforated, and through its aperture or cavity the gullet paſſes.

The brain of the louſe is ſhaped like a pear, and is divided into a right and left part. The dura mater, ſurrounding it, is formed like the membrane which covers

vers the marrow, and is provided with pulmonary pipes and particles of fat. I can very eaſily at any time ſhew the marrow, but the demonſtration of the brain muſt be obtained rather by chance, than with any premeditated deſign or art; it is clearly ſeen, when by any accident it happens to be ſtript of the parts wherewith it is covered.

The optic nerves are ſhort, and the eyes, which are connected to them, are ſo ſmall, that I could not diſſect them to my ſatisfaction; as well becauſe this operation is but aukwardly performed under microſcopes, which magnify objects ſo much, that all inſtruments are too coarſe for this purpoſe. Thus much, however, I diſtinctly ſaw, that this black part in the eyes might be ſeparated or lifted up from them; which part in other inſects I call the tunica uvea, not being ſituated at the bottom, but on the ſuperficies of the eye; after this appears the tunica cornea; this ſeemed divided as it were into hexagons, as it is in other inſects, though the other was not: but that I would not affirm for certain, for we are not to ſuppoſe or imagine, but to purſue by our ſenſes, and diſcover the actions and productions of nature. This opinion,

nion, however, does not pleaſe ſome anatomiſts, who therefore eſteem all comments on the brain merely as ingenious fancies. The younger Bartholinus, who, ſpeaking of the fiction that ſilkworms had no brain, expreſſes himſelf thus: "Behold, how many are pleaſed "with their own blindneſs! who, al"though they are blind, and ſhall for"ever remain ſo, yet cry aloud they can "ſee, ſince theſe their contemptible "works, which ought to be removed "from their eyes, and buried in obli"vion, are laſting monuments of their "cloudy arrogance; for by this means "they might afterwards ſeek for the light "of the truth."

Whether lice are diſtinguiſhed by the parts of generation, into males and females, as other inſects are, I could not diſcover. Heretofore indeed, I had ſometime remarked that lice get upon each other; but this I could not obſerve while employed in this diſſection. I found an ovary in every one of forty, which I diſſected; this almoſt inclined me to think, that theſe little animals are hermaphrodites; and perhaps they really have in each animal the generative parts in the ſame body, as I have found in

in ſnails. Whether indeed it be ſo, is ſtill a ſecret to me, for tho' I ſaw the ovary very diſtinctly, I could diſcover that only, notwithſtanding the great hopes I had of finding it, from having obſerved, that all kinds of inſects have very large organs of generation.

The ovary is extended through the whole cavity of the abdomen, ſo that with its appendages it reaches even to the breaſt. It has an opening diſtinct from the end of the inteſtines, for as the upper part of the fundament is placed in the diviſion of the tail, in which the abdomen ends; ſo, on the contrary, the vagina or mouth of the ovary opens into the lower part of the abdomen, where the body is divided as it were into two parts. The ends or extreme appendages of the oviduct or egg-paſſage are like two tubes, naturally joined in one point. In the oviduct are ſeen at once perfect eggs, and their rudiments or principles; ſo that in one ovary I have counted ten larger and forty-four ſmaller eggs, together making fifty-four. In the uterus I ſaw one perfect egg, which was fallen down ready for birth; at that time theſe little eggs are called nits.

The ovary is double in all lice, and every part of it is ſubdivided into five oviducts, which on each ſide end in one common canal; next comes in ſight the uterus, in which the egg acquires its full perfection. Where the uterus ends, is ſeen a ſacculus or bag full of a glutinous matter, opening in that part into the uterus; this is deſigned for faſtening the eggs, whilſt they are laying; the ſame may be likewiſe obſerved in many other inſects, and particularly in bees. I muſt acknowledge that I have not ſeen the glutinous matter contained in this bag; but I infer, from the ſituation and ſtructure of the part, that the bag was deſigned for keeping ſuch a ſubſtance. After this appears the neck of the uterus, and therein is a ſmall dilatation or expanſion; by means of which the ovary immediately opens itſelf into the outward womb.

The oviducts embrace the eggs ſo cloſely, that ſcarce any difference is obſerved between them, nor can we ſeparate the oviducts from the eggs, without great labour; when we do this, a great many bags of fat iſſue from thence which obſtruct the ſight. It therefore has appeared to me, that the ſtructure

of the oviduct is the ſame with that of the ſtomach and inteſtines; though the texture of this part is nevertheleſs more delicate, and that the globular particles proceed from thence with greater eaſe, than in the other viſcera. The oviducts are provided with many pulmonary pipes, of which, as we have already obſerved, this little animal has a very large number, though no bigger than a point; its ſtructure and viſcera, which excel all human art, the greateſt geniuſes ought to be amazed at, as I have here, though briefly, yet clearly explained and demonſtrated. I am perſuaded that I might make many more diſcoveries in it, if I had more time for that purpoſe, ſince I have completed this diſſection, and diſcovered theſe remarkable miracles in this microcoſm or little world, in the ſpace of ſix days. If the learned Daniel Heinſius, had ſearched for theſe things in nature herſelf, and not in his own fancy, and in books, he would not have written ſo poor an encomium on this inſect.

As to the ſtructure of the external ſkin of the louſe, it affords many particulars worthy of obſervation, nor is their any thing that bears a greater likeneſs to it, than ſtiff and tranſparent parchment: it

is in ſeveral places marked with ſmall grooves or channels, in the ſame manner as the ends of our fingers; which, when viewed with the beſt microſcopes, really ſeem to be ſo many diviſions of pulmonary pipes. But the lens of the microſcope muſt, for this purpoſe, be carefully managed; for as it is turned one way or another, different things are ſeen: one cannot bring the lens nearer, or remove it further, by the leaſt diſtance, but ſomething is immediately perceived by the ſight, which was not obſerved before. Globular particles, ſometimes appear in the place of channels, or oblong pipes, though the eye is always fixed on the ſame part; then between the grooves themſelves, where the ſkin is ſimply membranaceous, globular particles are likewiſe obſerved. In other places, as in the extremities of the abdomen, the ſtructure of the ſkin is different; for there it ſeems to be compoſed as it were of irregular ſquares, wherein circular grooves may be ſeen in one part; in another globules; in a third, both globules and grooves, nay, ſometimes the plain tranſparent ſkin only is ſeen full of points; all which, as we have before obſerved of the oblong grooves

are repreſented according to the tranſparency of the parts, which have not been yet totally ſeparated from the inner ſurface of the ſkin; or juſt as the microſcope is moved, ſomewhat nearer to, or farther from the ſkin.

## THE BUG.

THIS alſo is a nauſeous inſect, which intrudes upon the retreats of mankind. The night is uſually the ſeaſon when the wretched have reſt from their labour; but this ſeems the only ſeaſon when the bug iſſues from its retreats to make its depredations. It cunningly avoids the light; but, when darkneſs promiſes it ſecurity, it iſſues from every corner of the bed, and greedily attacks its prey. Happily, however, for Great Britain, they multiply leſs in that iſland, than in any part of the continent: in France and Italy the beds ſwarm with them; and in thoſe countries they grow larger, and bite with a more cruel appetite than they do with us.

This animal conſiſts of three principal parts; the head, the corſelet, and the belly. It has two feelers, with three joints; beneath theſe there is a

crooked trunk, which is its inſtrument of torture, and which lies cloſe upon the breaſt when it is in motion: the breaſt is a kind of ring, and the belly conſiſts of nine rings. It has ſix legs. Its body is ſmooth, except that it has a few ſhort hairs near the vent, which may be ſeen by the microſcope. Its motion is ſlow and unwieldy. The ſmell of this inſect, when killed, is inſupportable.

Linnæus reckons up forty of the bug kind; but the principal are the common bug; the green and yellow bug; the plant bug; and the graſs bug.

## THE WOOD-LOUSE.

THIS inſect ſeldom exceeds half an inch in length, and a quarter of an inch in breadth. Thoſe found about dung-hills, and on the ground, are uſually of a livid black; but thoſe found under timber, tiles, and in drier places, are of a lighter colour. Of this inſect Linnæus makes three ſpecies; that with ſeventy feet on each ſide, that with fifteen; and that with twenty. It has two ſhort feelers, and the body is of an oval ſhape. When touched, it rolls itſelf

ſelf up into a kind of ball; and the ſides, near the feet, are dentated like a ſaw. Wood-lice have great medicinal virtues, being impregnated with a ſaline quality, which is diuretic and ſtimulating.

## THE MONOCULUS, OR WATER FLEA.

WATER FLEAS are of a blood colour, and are ſometimes ſeen in ſuch multitudes on the ſurface of ſtanding water, that many people have taken it for blood. It is peculiar to the water, and has the legs before divided into branches, with which it either ſwims or leaps, and the body is covered with a cruſt or ſhell. It appears to have but one eye.

## THE SCORPION.

THIS is one of the largeſt of the inſect tribe, and is not leſs terrible from its ſize than its malignity. Its ſhape ſomewhat reſembles that of a lobſter, but is infinitely more hideous. Nine different kinds of this dangerous inſect have been enumerated; but they are principally diſtinguiſhed by their colour:

lour: ſome are yellow, others brown; ſome are of an iron grey; and others are black, red, and white. The head of the ſcorpion ſeems to be joined to the breaſt; in the middle of which are ſeen two eyes, and two others are placed more forward in the fore part of the head: theſe eyes are ſo ſmall as to be almoſt inviſible. On each ſide of the head are two arms, each compoſed of four joints; the laſt of which is large and ſtrong, and reſembles a lobſter's claw. Below the breaſt are eight articulated legs, each divided into ſix joints, the two hindmoſt of which are each provided with two crooked claws. The belly is divided into ſeven little rings; and the tail is compoſed of ſix joints, which are briſtly, and appear like little globes; the laſt being armed with a crooked ſting: this is that fatal inſtrument which renders this inſect ſo truly miſchievous and formidable. As it generally takes ſhelter in houſes, it frequently ſtings thoſe among whom it reſides. In ſome of the towns of Italy, and in the province of Languedoc, in France, it is one of the greateſt peſts that torment mankind: but by the natives of Africa and the Eaſt, their malignity

is

is woefully experienced. In Batavia, where they grow twelve inches long, a piece of furniture cannot be moved in the houſe without the utmoſt danger of being ſtung by them. We are aſſured by Boſman, that, along the Gold Coaſt, they are frequently ſeen larger than a lobſter; and that their ſting is inevitably fatal. In Europe, however, they are neither ſo plenty, ſo large, nor ſo venomous. There it ſeldom exceeds two or three inches in length, and its ſting is not often fatal.

## THE SCOLOPENDRA AND GALLY WORM.

WE know little except the figure and the noxious qualities of theſe inſects. We have ſome in this country that reſemble them in form, but we are placed at a happy diſtance from ſuch as are really formidable. With us they ſeldom exceed the length of an inch, but in the tropical climates they are ſometimes found nine inches long. The ſcolopendra, from the number of its feet, is alſo called the centipes. Thoſe of the Eaſt Indies are about ſix inches long, of a ruddy colour, and as thick

as

as a man's finger: they conſiſt of many joints, and have a leg on each ſide of every joint: they are covered with hair, and ſeem to have no eyes: the head is round, and furniſhed with two ſmall teeth, with which they inflict wounds that are painful and dangerous.

The gally-worm differs from the ſcolopendra in having double the number of feet: ſome of them are ſmooth and others hairy; ſome are black, others yellow, and others brown. When touched, they all roll themſelves up in a ball. In Europe they are perfectly harmleſs. All theſe, as well as the ſcorpion, are produced perfect from the parent or the egg, and ſuffer no changes after excluſion.

## THE LEACH.

THE common leach is a water inſect: it has the general figure of a worm, and is about as long as a man's middle finger. Its ſkin is compoſed of rings, by means of which it ſwims with ſome agility in the water. When out of water it contracts itſelf in ſuch a manner, that, when touched, it is not above an inch long. It has a ſmall head,

head, and a black ſkin, edged with a yellow line on each ſide: the belly is of a reddiſh colour, marked with whitiſh yellow ſpots. It is remarkable, that the mouth of this animal can aſſume whatever form it finds convenient. When at reſt, however, the opening is uſually triangular, and within it are placed three very ſharp teeth. Theſe animals are very uſeful in medicine, and when they are applied, they ſhould be taken from the water in which they are contained about an hour before, for they thus become more voracious, and faſten more readily. The moſt remarkable particular of this animal is, that tho' it takes a large quantity of food, it has no paſſage to eject it from the body when it has been digeſted: it is ſuppoſed to go off thro' the pores of the body.

The *horſe-leach* is larger than the former, and grows to four inches in length. It has a ſmooth gloſſy ſkin, black on the back, ſpotted with grey. It is of no uſe, as it will not ſtick to the ſkin.

The *ſnail-leach* is about an inch in length, and of a very flat ſhape: its ſkin is ſmooth and gloſſy, and of a whitiſh colour. This leach will ſtick, tho'

it

it is not large enough to extract a ſufficient quantity of blood from the patient.

The *broad tailed* leach grows to an inch and an half in length, and has a ſmooth gloſſy ſkin, of a duſky brown colour. The back is raiſed into a kind of ridge. It will ſtick but on very few occaſions. It is common on ſtones in ſhallow running waters.

## THE LIBELLA, OR DRAGON FLY.

THESE inſects are called by different names in different parts of the kingdom: they are of all colours, blue, green, crimſon, white, ſcarlet, or a union of the moſt agreeable tints. They are diſtinguiſhed from all other flies, by the length of their bodies, the largeneſs of their eyes, and the beautiful tranſparency of their wings, which are four in number. Though there are three or four different kinds of dragon flies, they all agree in the moſt ſtriking parts of their hiſtory. The largeſt are from two to three inches long; their tail is forked: their body divided into eleven rings; and their wings are of a beautiful gloſſy tranſparency. They have two teeth, covered with a beau-

beautiful lip; they bite fiercely when they are taken; but their bite is perfectly harmleſs. Theſe animals are produced from eggs, depoſited in the water; they afterwards become worms, and have ſix legs; they continue in their reptile ſtate for a year; at length their leaves expand, and they enter upon the flying ſtate.

## THE ANT-LION.

THIS inſect in its reptile ſtate, is of the ſize of a common wood-louſe, but ſomewhat broader. It has a longiſh head, and a roundiſh body, which becomes a little narrower towards the tail. The colour is a dirty grey, ſpeckled with black. The body is compoſed of ſeveral flat rings, which ſlip one upon another. It has ſix feet, four fixed to the breaſt, and two to the neck. It is generally produced in autumn, and in about a year afterwards it aſſumes a winged form, and becomes a large and beautiful fly of the libellular kind, with a long ſlender body of a brown colour; with large bright eyes, long ſlender legs, and four large tranſparent wings.

## THE GRASS-HOPPER, AND THE LOCUST.

THERE are a tribe of little animals, which, though differing in ſize and colour, ſtrongly reſemble each other in figure, appetite, and nature. Of this variegated tribe, the common graſs-hopper, that is found in ſuch plenty in every meadow, and that continues chirping through the ſummer, is beſt known to us; and a hiſtory of that will contain a hiſtory of all the reſt. The colour of this animal is green, with a line of brown which ſtreaks the back, and two pale lines under the belly and behind the legs. The head is oblong, in ſome degree reſembling that of a horſe. The mouth is armed with teeth of a brown colour, hooked at the point. The corſlet is elevated, narrow, armed above and below by two ſerrated ſpines. The back is armed with a ſtrong buckler. The laſt pair of legs are longer and ſtronger than the firſt two pair, fortified by thick muſcles, and admirably formed for leaping. It has four wings; the belly is compoſed of four rings, and terminated by a forked tail.

The

The graſs-hopper, though ſeemingly without wings, is in reality poſſeſſed of them from the firſt, but it cannot break the bonds by which they are folded up, till it has been excluded above twenty days. When arrived at their winged ſtate they are ſtill vocal, and in the midſt of ſummer are heard much louder at ſun-ſetting than during the heat of the day. Though ſlow in flight, they are ſometimes ſeen to fly to conſiderable diſtances.

The larger kinds differ from this only in ſize, rapidity of flight, and the powers of injuring mankind, by ſwarming upon the productions of the earth. The graſs which is deſtroyed by a few graſs-hoppers which ſport in our fields can be of no great conſequence; but when a ſwarm of locuſts, two or three miles in length, and ſeveral yards in depth, ſettle upon a field, the conſequences are frightful.

Europe is ſeldom viſited by them in this manner. Thoſe which were ſeen in ſeveral parts of England in the year 1748, were the great brown locuſts, and dreadful conſequences were apprehended from their appearance. They were about three inches long.

Locuſts are eaten by the natives in many kingdoms of the Eaſt. They certainly were a common food with the Jews, as Moſes, in the book of Leviticus, permits them to eat four different kinds of this animal, which he particularly ſpecifies.

The great Weſt-Indian locuſt is the moſt noxious of this tribe of animals. It is armed with a ſting, and thoſe who touch it are ſure to be ſtung by it: a little palm-oil, however, is a certain cure for it.

## *The* CRICKET.

THIS inſect reſembles the graſs hopper in its ſhape, its voice, and its leaping; but its colour is uniformly of a ruſty brown. Its reſidence is moſt uſually in the warmeſt chinks behind a country hearth. It is of a moſt chilly nature, ſeldom quitting the fire-ſide. It is a voracious little animal, and will eat ſugar, bread, meat, or flower. Except in the very coldeſt weather, they never ceaſe their chirruping.

There is a ſpecies of this inſect that lives entirely in the woods and fields.

The mole-cricket is a very large inſect,

ſect, being two inches and an half in length, and three quarters of an inch in breadth. It chiefly reſides under the ſurface in ſoft garden grounds, and is very injurious to gardeners.

## THE EARWIG AND THE FROTH INSECT.

THE earwig is ſo common as hardly to require a deſcription: it is equally remarkable for its ſwiftneſs in the reptile ſtate, and its velocity when it has arrived to its winged ſtate. It is very prolific, and very harmleſs. The name, and the deformity of its figure, have ſubjected it to an imputation which has often procured its deſtruction. It is ſaid that it often enters into the ears of people ſleeping; thus cauſing madneſs from the intolerable pain, and ſoon after death itſelf; theſe reproaches, however, are entirely groundleſs: it were to be wiſhed, that the accuſations which gardeners bring againſt the earwig were as ſlightly founded. At length the wings of this animal burſt from their confinement, and when it becomes a winged inſect it flies in purſuit of the female, ceaſing to feed, and is wholly employed in the buſineſs

of propagation. After having lived a few days in its winged ſtate, and taken care for the continuance of poſterity, it dries up and expires.

To this order of inſects belong the cuckow ſpit or froth-worm, that is often found in the frothy matter on the ſurface of plants. The water tipula, the common water fly may be claſſed in the ſame order. To theſe may be added the water-ſcorpion, which is near an inch in length, and half an inch in breadth. The water-ſcorpion lives in the water by day, out of which they riſe into the air in the duſk of the evening, and often betake themſelves to other waters in queſt of food.

## THE EPHEMERA.

THERE are ſeveral kinds of ephemeras, which are of various colours, as brown, yellow, and cream-coloured. It appears ſurprizing that there ſhould be a tribe of flies whoſe duration extends but to a day; but ſome of this kind ſeem to be born and to die in a much ſhorter time: the reptile, however, from which they are bred, are ſometimes known to live two or three years. They are produced

duced from the egg in the form of worms, from whence they change into the form of aurelias; and from thence they take their laſt mutation, which is into a beautiful fly, of a ſhorter or longer duration, according to its kind. In its fly ſtate, it is a beautiful winged inſect, and ſtrongly reſembles the butterfly. But though the uſual date of theſe flies is five or ſix hours, there are ſome kinds that live ſeveral days.

## THE CATERPILLAR, BUTTERFLY, AND MOTH.

CATERPILLARS are readily diſtinguiſhed from worms or maggots by the number of their feet, and by their producing butterflies or moths. All this claſs have from eight to ſixteen feet; and the animal into which they are converted is always a butterfly or a moth. It is well known, that all theſe little animals are hatched from the eggs of butterflies, and, during winter, the greateſt number of caterpillars are in an egg ſtate. When it has ſtrength to break its ſhell, it always finds its favourite aliments provided in abundance before it.

The

The body of a caterpillar is compoſed of rings, which are generally twelve in number; by which they may be diſtinguiſhed from any other inſects that reſemble them. The head is connected to the firſt ring by the neck: the jaws are placed rather vertically, and each jaw is armed with a large thick tooth. With theſe the animals devour their food in amazing quantities. A ſingle caterpillar will eat double its own weight of leaves in a day, without appearing to be diſordered by the meal.

With regard to their external figure, caterpillars are either ſmooth or hairy; they have in general ſix ſmall black ſpots on the circumference of the fore ring; three of which are larger than the reſt, which Reaumur ſuppoſes to be eyes. This inſect has nine holes on each ſide of the body, through which it is ſuppoſed to breathe; they are called the ſtigmata.

The life of the caterpillar ſeems to be one continued ſucceſſion of changes, and, before the great metamorphoſis, changes its ſkin eight or ten times. At length it becomes an aurelia; and one would imagine, that they were conſcious of the preciſe time of their continuance in their aurelia ſtate; their little

ſe-

ſepulchres, with reſpect to their ſolidity, being proportioned to ſuch duration. At length the butterfly burſts from its aurelia ſkin, and decorates our fields with its ſymmetry and beauty.

The number of butterflies is very great: Linnæus has reckoned up above ſeven hundred and ſixty different kinds, and the catalogue is ſtill very incomplete. Thoſe of the warmer climates, however, are larger and more beautiful than ſuch as are bred at home.

It is not by day alone that theſe animals are ſeen fluttering wantonly from flower to flower, as the greateſt number of them fly by night, and expand the moſt beautiful colouring, at thoſe hours when there is no ſpectator. They are therefore divided into diurnal and nocturnal flies; or butterflies and moths. They may be readily diſtinguiſhed from each other by their horns or feelers: thoſe of the butterfly being clubbed or knobbed at the end: and thoſe of the moth tapering finer and finer to a point. The female moth lays its eggs ſoon after it leaves the aurelia, but many of the butterflies do not think of providing for poſterity till the ſummer is far advanced.

## THE SILKWORM.

THIS little animal, which only works for itſelf, has been of infinite ſervice to the human race, and furniſhes them with a more beautiful covering than can be ſupplied by any other animal. It is imagined, that ſilkworms were not brought into Europe till the beginning of the twelfth century; when Roger of Sicily brought ſome manufacturers in ſilk from Aſia Minor, on his return from his expedition to the Holy Land, and ſettled them in Sicily and Calabria. From theſe this manufacture was taught to the other kingdoms of Europe.

The ſilkworm is a large caterpillar of a whitiſh colour, with twelve feet, and is afterwards transformed into a butterfly of the moth kind. The cone on which it ſpins, is formed for covering it while it remains in the aurelia ſtate; and ſeveral of theſe, when properly wound off, and united together, form thoſe ſtrong and beautiful threads, which are woven into ſilk: and, as our luxuries are encreaſed, the ſilk manufacture is become one of the moſt lucrative of any in the ſouthern provinces of Europe.

Previous to ſpinning its web, the ſilk-worm ſeeks for a convenient place to erect its cell, without any obſtruction. Having found a leaf, or a chink fitted to its purpoſe, it begins to writhe its head in every direction; and faſtens its thread on every ſide to the ſides of its retreat.

In the courſe of a fortnight or three weeks the aurelia is changed into a moth: no ſooner is the winged inſect completely formed, than, having diveſted itſelf of its aurelia ſkin, it prepares to burſt through its cone, or outward priſon, and by repeated efforts becomes emancipated. This animal, in its fly ſtate, ſeems produced for no other purpoſe than to tranſmit a future brood. It neither flies nor eats; the male only ſeeking the female; their union continues for about four days without interruption; the male then dies, and the female ſurvives him only till ſhe has laid her eggs; which, in the enſuing ſpring, are hatched into worms.

## THE BEE.

THE bee is a ſmall and well known inſect, famous for its induſtry.

This

This uſeful and laborious inſect is divided by two ligaments into three parts or portions, the head, the breaſt, and the belly. The head is armed with two jaws and a trunk; the former of which play like two jaws opening and ſhutting to the right and left. The trunk is long and taper, and, at the ſame time, extremely pliant and flexible, being deſtined by nature for the inſect to probe to the bottom of the flowers, through all the impediments of their chives and foliage; and drain them of their treaſured ſweets: but were this trunk to be always extended, it would prove incommodious, and be liable to be injured by a thouſand accidents, it is therefore of ſuch a ſtructure, that, after the performance of its neceſſary functions, it may be contracted, or rather folded up; and beſides this, it is fortified againſt all injuries by four ſtrong ſcales, two of which cloſely ſheathe it, and the two others, whoſe cavities and dimenſions are larger, encompaſs the whole. From the middle part or breaſt of the bee grow the legs, which are ſix in number: and at the extremity of the paws are two little hooks, diſcernible by the microſcope, which appear like ſickles, with their points oppoſite

ſite to each other. The wings are four, two greater and two ſmaller, which not only ſerve to tranſport them through the air, but, by the noiſe they make, to give notice of their departure and arrival, and to animate them mutually to their ſeveral labours. The hairs with which the whole body is covered, are of ſingular uſe in retaining the ſmall duſt that falls from the chives of the flowers, of which the wax is formed. The belly of the bee conſiſts of ſix rings, which ſlide over one another, and may be lengthened or contracted at pleaſure; and the inſide of this part of the body contains the inteſtines, the bag of honey, the bag of poiſon, and the ſting. The office of the inteſtines is the ſame as in other animals. The bag of honey is tranſparent as cryſtal, containing the ſweet juices extracted from flowers, which the bee diſcharges into the cells of the magazine for the ſupport of the community in winter. The bag of poiſon hangs at the root of the ſting, through the cavity of which, as through a pipe, the bee ejects ſome drops of this venomous liquor into the wound, and ſo renders the pain more exceſſive. The mechaniſm of the ſting is admirable, being compoſed of two darts, incloſed with-

in a ſheath that tapers into a fine point, near which is an opening to let out the poiſon. The two darts are ejected thro' another aperture, which, being armed with ſeveral ſharp beards like thoſe of fiſh hooks, are not eaſily drawn back again by the bee; and indeed ſhe never diſengages them if the wounded party happens to ſtart and put her into confuſion; but if one can have patience to continue calm and unmoved, ſhe clinches thoſe lateral points round the ſhaft of the dart, by which means ſhe recovers her weapons, and gives leſs pain to the perſon ſtung. The liquor which at the ſame time ſhe infuſes into the wound, cauſes a fermentation, attended with a ſwelling, which continues ſeveral days; but that may be prevented by immediately pulling out the ſting, and enlarging the puncture, to let the venomous matter have room to eſcape.

Let us now conſider the generation, polity, and labours of theſe inſects, the true knowledge of which is very much owing to the modern invention of glaſs-hives, through which all the ſecrets of the community are laid open to a curious obſerver. Any perſon who carefully examines a hive at different ſeaſons of the year,

year, will diſtinguiſh three ſorts of bees; of which the far greater number are the common working bees, who do all the buſineſs of the hive, and ſeem to be neither male nor female. The working bee. The ſecond ſort, called drones, are the males, and ſomewhat larger than the former; they have no ſting, nor ever ſtir from the hive, but live upon the honey prepared by the others. The third ſort is a much larger and longer bodied bee, of which there are often but one in every ſwarm or colony of young bees, who are from time to time detached from the hive in ſearch of another habitation. This large bee is what the ancients called the king, from the reſpect they always ſaw paid to it by the other bees; but being the female, the moderns more properly give the title of queen, or mother of the ſwarm.

When theſe induſtrious inſects begin their works, it is obſerved they divide themſelves into four parties, one of which is deſtined to the fields to provide materials for the ſtructure; the ſecond works upon thoſe materials, and forms them into a rough ſketch of the dimenſions and partitions of the cells; the third examines and adjuſts the angles, removes

the ſuperfluous wax, poliſhes the work, and gives it its neceſſary perfection; and the fourth is employed in bringing proviſions to the labourers that build them, becauſe poliſhing is not ſo laborious. They begin their work at the top of the hive, continuing downwards to the bottom, and from one ſide to another; and to make it the more ſolid they uſe a ſort of tempered wax, reſembling glue. The form of the cells of the honey-comb is hexagonal, which figure, beſides what is common with a ſquare and equilateral triangle, has the advantage of including a greater ſpace within the ſame ſurface.

The expedition of the bees in their labour, is almoſt incredible; for notwithſtanding the elegance and juſt proportions of the work, they are ſo indefatigable, that they will, in one day, finiſh a honey-comb a foot long, and ſix inches broad, capable of receiving three thouſand bees.

When the cells are completed, the queen takes poſſeſſion of thoſe ſhe likes beſt to depoſit her eggs in, and the reſt are left to be filled with honey. She lays one egg in each cell, and ſometimes more than an hundred of thoſe eggs in a day; but what is ſtill more remarkable, ſhe lays

lays thoſe eggs which are to produce common bees in cells of the common ſhape and ſize, thoſe that are to become drones or males, in the cells of a larger ſize, and depoſits thoſe which are to become females, like herſelf, in the ſpheroidical cells already deſcribed.

Theſe eggs, after lying ſome time in the cells, are hatched into maggots, and fed with honey ten or twelve days, after which the other bees cloſe up the cells with a thin piece of wax; and under this covering they become gradually tranſformed into bees, in the manner as ſilkworms are into butterflies. Having undergone this change, the young bees pierce through their waxen doors, wipe off the humidity from their little wings, take their flight into the fields, rob the flowers of their ſweets, and are perfectly acquainted with every neceſſary circumſtance of their future conduct. As to the males or drones, which are deſtined only to propagate their ſpecies, they live very comfortably for about three months after they are hatched; but when that time is over, and the females are impregnated, the common bees either kill them or drive them from the hive, as burthen-

ſome to the community, and not a drone is to be found till the next ſeaſon.

It is an excellent obſervation of a modern author, that the hive is a ſchool to which numbers of people ought to be ſent; prudence, induſtry, benevolence, public ſpiritedneſs, œconomy, neatneſs, and temperance, are all viſible among the bees. Theſe little animals are actuated by a ſocial ſpirit, which forms them into a body politic, intimately united, and perfectly happy. They all labour for the general advantage; they are all ſubmiſſive to the laws and regulations of the community: having no particular intereſt, no diſtinction but thoſe which nature or the neceſſities of their young have introduced amongſt them. They are free, becauſe they only depend on the laws; they are happy, becauſe the concurrence of their ſeveral labours inevitably produces abundance, which contributes to the riches of each individual. Let us compare human ſocieties with this, and they will appear altogether monſtrous. Neceſſity, reaſon, and philoſophy, have eſtabliſhed them for the commendable purpoſes of mutual aid and benefits: but a ſpirit of ſelfiſhneſs deſtroys all; and one half of mankind, to load themſelves with ſuper-

fluities

fluities, leave the other deſtitute of common neceſſaries.

When the hive is become too much crowded, by the addition of the young brood, a part of the bees think of finding themſelves a more commodious habitation, and with that view ſingle out the moſt forward of the young queens. A new ſwarm is, therefore, conſtantly compoſed of one queen at leaſt, and of ſeveral thouſand working bees, as well as of ſome hundreds of drones. The working bees are ſome old, ſome young.

The uſual method of uniting ſwarms is very eaſy. Spread a cloth at night upon the ground cloſe to the hive in which the two caſts or ſwarms are to be united; lay a ſtick acroſs this cloth; then fetch the hive with the new ſwarm, ſet it over the ſtick, give a ſmart ſtroke on the top of the hive, and all the bees will drop down upon the cloth in a cluſter. This done, throw aſide the empty hive, take the other from off the ſtool, and ſet this laſt over the bees, who will ſoon aſcend into it, mix with thoſe already there, and become one and the ſame family. Others, inſtead of ſtriking the bees down upon the cloth, place with its bottom upmoſt the hive in which

which the united ſwarms are to live, and ſtrike the bees of the other hive down into it. The former of theſe hives is then reſtored to its natural ſituation, and the bees of both hives ſoon unite. If ſome bees ſtill adhere to the other hive, they may be bruſhed off on the cloth, and they will ſoon join their brethren, Or one may take the following method. which gives leſs diſturbance to the bees. Set with its mouth upmoſt the hive into which the young ſwarm has been put, and ſet upon it the other hive. The bees in the lower hive, finding themſelves in an inverted ſituation, will ſoon aſcend into the upper.

Columella directs, that the apiary, or bee-garden, face the ſouth, in a place neither too hot, nor too much expoſed to the cold; that it be in a valley, in order that the loaded bees may with the greater eaſe deſcend to their homes; that it be near the manſion-houſe, on account of the conveniency of watching them, but ſo ſituated as not to be expoſed to noiſome ſmells, or to the din of men or cattle; that it may be ſurrounded with a wall, which, however, ſhould not riſe above three feet high; that, if poſſible, a running ſtream be near them,

or,

or, if that cannot be, that water be brought near them in troughs, with pebbles or ſmall ſtones in the water, for the bees to reſt on whilſt they drink; or that the water be confined within gently declining banks, in order that the bees may have ſafe acceſs to it; they not being able to produce either combs, honey, or food for their maggots without water. That the neighbourhood of rivers or baſons of water with high banks be avoided, becauſe winds may whirl the bees into them, and they cannot eaſily get on ſhore from thence to dry themſelves; and that the garden in which the apiary ſtands be well furniſhed with ſuch plants as afford the bees plenty of good paſture. The trees in this garden ſhould be of the dwarf kind, and their heads buſhy, in order that the ſwarms which ſettle on them may be the more eaſily hived.

We come now to explain the moſt inhuman method commonly practiſed of taking bees, which conſiſts in wantonly deſtroying the whole ſmarm, in order to enjoy the fruits of their labours.

Were we to kill the hen for her egg, the cow for her milk, or the ſheep for the fleece it bears, every one would inſtantly

ſtantly ſee how much we ſhould act contrary to our own intereſt: and yet this is practiſed every year in regard to bees. Would it not argue more wiſdom in us to be contented with taking away only a portion of their wax and honey, as is the practice of many countries? The common method here is, that when thoſe which are doomed for ſlaughter have been marked out (which is generally done in September) a hole is dug near the hive, and a ſtick, at the end of which is a rag that has been dipped in melted brimſtone, being ſtuck in that hole, the rag is ſet on fire, the hive is immediately ſet over it, and the earth is inſtantly thrown up all around, ſo that none of the ſmoke can eſcape. In a quarter of an hour, all the bees are ſeemingly dead; and they will ſoon after be irrecoverably ſo, by being buried in the earth that is returned back into the hole: I ſay, they will ſoon be abſolutely killed by this laſt means; becauſe it has been found, by experiment, that all the bees which have been affected only by the fume of the brimſtone, recover again, excepting ſuch as have been ſinged or hurt by the flame. Hence it is evident, that the fume of brimſtone might be

uſed

uſed for intoxicating the bees, with ſome few precautions. The heavieſt and the lighteſt hives are alike treated in this manner; the former, becauſe they yield the moſt profit, with an immediate return; and the latter, becauſe they would not be able to ſurvive the winter. Thoſe hives which weigh from fifteen to twenty pounds, are thought to be the fitteſt for keeping.

The practice of the ancients was, however, very different from this: they were content to ſhare with theſe induſtrious inſects the produce of their labours; and ſome very laudable attempts have been made in our own country, to attain the deſirable end of getting the honey and wax without deſtroying the bees. John Geddy, Eſq. publiſhed in the year 1665, his invention of boxes for preſerving the lives of bees. Theſe were improved by Joſeph Warder, phyſician, at Croydon, who at the ſame time embelliſhed his account of the ſtructure and uſe of theſe boxes, with ſeveral other curious circumſtances concerning bees, in his work, intitled, The True Amazons, or the Monarchy of bees. Two very worthy clergymen, the reverend Mr. John Thorley, of Oxford,

ford, and the reverend Mr. Stephen White, M. A. Rector of Holton, in Suffolk, have brought the method of preſerving the lives of bees to ſtill greater perfection.

The indefatigable Mr. Wildman, ſo univerſally known for his curious experiments with bees, has obliged the world with the following method of taking the wax and honey, without deſtroying the bees:

Remove, ſays he, the hive from which you would take the wax and honey into a room, into which admit but little light, that it may at firſt appear to the bees as if it were late in the evening. Gently invert the hive, placing it between the frames of a chair, or other ſteady ſupport, and cover it with an empty hive, keeping the ſide next the window of the empty hive raiſed a little, to give the bees ſufficient light to get into it. While you hold the empty hive ſteadily ſupported on the edge of the full hive, beween your ſide and your left arm, keep ſtriking with your other hand all round the full hive from top to bottom, in the manner of beating a drum, ſo that the bees may be frightened by the continual noiſe from all quarters;

and

and they will in conſequence mount out of the full hive into the empty one. Repeat the ſtrokes rather quick than ſtrong round the hive, till all the bees are got out of it, which will generally be in about five minutes. It is to be obſerved, that the fuller the hive is of bees, the ſooner they will have left it. As ſoon as a number of them have got into the empty hive, it ſhould be raiſed a little from the full one, that the bees may not continue to run from the one to the other. And as ſoon as all the bees are out of the full hive, the other, in which the bees are, muſt be placed on the ſtand from which the former hive was taken, in order to receive the abſent bees as they return from the fields.

If this be done early in the ſeaſon, the operator ſhould examine the royal cells; for if any of them contain young bees, they muſt, as well as all the combs that have young bees in them, be ſaved in the hive. Take out the other combs with a long broad and pliable knife; cutting them from the ſides and crown as clean as poſſible, to ſave the future labours of the bees, who muſt lick up the honey ſpilt, and remove every grain of wax: the ſides of the hive ſhould

then be ſcraped with a table ſpoon, to clear away what was left by the knife.

Having thus finiſhed taking the wax and honey, let a table covered with a clean cloth be placed near the ſtand, and giving the hive in which the bees are a ſudden ſhake, ſtriking it at the ſame time pretty forcibly, the bees will be ſhaken on the cloth. Put their own hive over them immediately, raiſed a little on one ſide, that the bees may the more eaſily enter, and when all are entered, place it on the ſtand as before. If the hive in which the bees are, be turned uppermoſt, and their own hive placed over it, the bees will immediately aſcend into it, eſpecially if the lower ſides be ſtruck to alarm them: for the effects of fear impreſſed on the bees, by the continual noiſe, renders them for a conſiderable time ſo mild and tractable, that they will bear any handling, which does not hurt them, without any ſhew of reſentment.

## THE WASP AND HORNET.

THOUGH the bee and the waſp reſemble each other very ſtrongly, yet they differ very widely in their manner and duration. The waſp is well known to

be a winged inſect with a ſting: it is longer in proportion than the bee, and is marked with bright yellow circles round the body: it is the ſwifteſt and moſt active inſect of all the fly kind. It has a long tooth on each ſide of the mouth, with which it is enabled to cut almoſt any ſubſtance, and carry it to its neſt.

Like bees, theſe inſects live in community, and ſometimes upwards of ten thouſand are found inhabiting one neſt. Among bees every community is compoſed of females, or queens, drones or males, and neutral or working bees. The occupations of waſps are ſimilar; the two firſt are for propagating the ſpecies, the laſt for defending and nurſing the riſing progeny. Bees, however, have ſeldom more than a queen or two in an hive; among waſps there are two or three hundred. The neſt of the waſp is very curious, the conſtruction of which is not very different from that of the bee; and each cell is hexagonal, like that of the bee.

The waſps of Europe are very miſchievous, but they are innocent when compared to thoſe of the tropical climates, where all the inſect tribes are not only numerous, but large, voracious,

cious, and formidable. In ſome of the iſlands no precautions can prevent their attacks, and their ſting is ſometimes as terrible as that of a ſcorpion.

The hornet is about twice as large as the waſp, but ſtrongly reſembles it in ſhape. It has four wings, thoſe above being double the ſize of thoſe below. It makes a greater noiſe in flying than a waſp, and is a very troubleſome and dangerous inſect.

## THE ICHNUMON FLY.

THERE are many different kinds of this inſect, but that which is the moſt formidable is called the common ichnumon. The body is long, ſlender, and black: the head, breaſt, feelers, and weapon at the tail are of the ſame colour: it has four wings, like the bee, which are tranſparent, with a black ſpot near the edge of each. The weapon at the tail is longer than the body, and conſiſts of three parts like hairs. Ray calls it the Waſp Ichnumon. This creature is a dreadful enemy to the inſect tribe, but a particular friend to mankind. The millions it deſtroys in a ſummer are inconceiveable; and without ſuch a deſtroyer,

ſtroyer, the fruits of the earth would only furniſh a banquet for the inſect race.

## THE ANT.

THESE inſects are famous from all antiquity for their ſocial and induſtrious habits: they are offered as a pattern of parſimony for the profuſe, and of unremitting diligence to the ſluggard. It is, however, ſurpriſing that all the writers of antiquity ſhould deſcribe this inſect as labouring in the ſummer, and feaſting upon the produce during the winter; it being well known that they require no ſupply of winter proviſions, as they are actually in a ſtate of torpidity during that ſeaſon. But this may not, perhaps, be the caſe in ſome of the warmer climates, where the winter is mild.

The common ants are of two or three different kinds; ſome are red, others black; ſome have ſtings, others have none. Such as have ſtings, inflict their wounds with them; ſuch as have not, ſpurt from their hinder parts an acid pungent liquor. The body of an ant is divided into the head, breaſt, and belly. The eyes are black, and under them are two ſmall horns or feelers. The breaſt

is covered with a fine ſilky hair, from which proiect ſix legs, the extremities of each have two ſmall claws. The body is of a brown cheſnut colour, ſomewhat reddiſh about the belly. Like bees, they are divided into males, females, and the neutral or working tribe. The females are larger than the males, and the working ants are the ſmalleſt of all. The former in general have wings, the latter never have any; and upon them are devolved all the labours that tend to the welfare of the community. The males and females mix with the working multitude, but ſeem no way to partake in the common drudgeries of the ſtate.

The fond attachment which the working ants ſhew to the riſing progeny is amazing: in cold weather they convey them in their mouths to the very depths of their habitation, where they are leſs ſubject to the ſeverity of the ſeaſon. In a fine day they remove them nearer the ſurface, where their maturity may be aſſiſted by the warm beams of the ſun.

The ants of Africa are of three kinds, the red, the green, and the black; the latter is a very formidable inſect, and above an inch in length. Their ſting produces great pain, and their depreda-

tions

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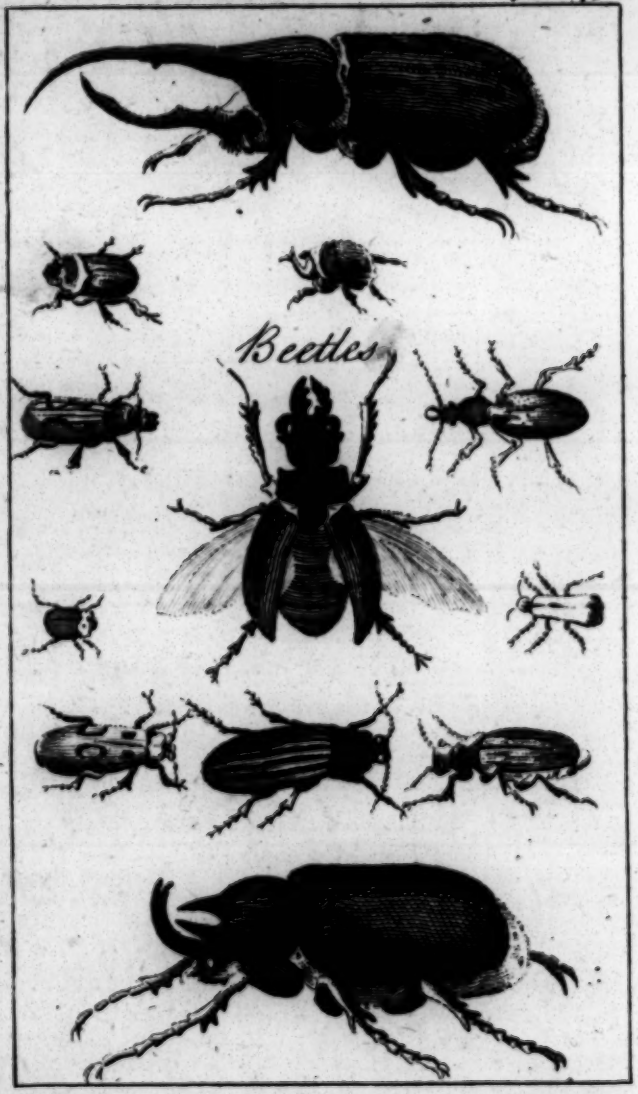
Beetles

sions are sometimes extremely destructive. From their hills, which are from six to twelve feet high, they sally out in a body in quest of adventures, and sometimes sheep, fowls, and even rats, are killed and devoured by these mercileſs insects.

## THE BEETLE.

THERE are various kinds of the beetle, all concurring in one common formation of having cases to their wings. Such a covering is the more necessary to these insects, as they sometimes live under the surface of the earth, in holes which are made by their own industry. The May-bug or dorr-beetle is so well known as to require no description. The elephant beetle is the largest of this kind hitherto known; it is found in South America, particularly Surinam, and about the river Oroonoko. It is black, and the whole body is covered with a hard shell. Its length from the hinder part to the eyes is about four inches. The cantharis is of the beetle kind, from whence come cantharides, well known by the name of Spanish flies, and for their use in blisters. Some are of a pure azure colour, others of pure gold, and others of a mixture of both. They are chiefly

chiefly natives of Spain, Italy and Portugal. The cochineal is an inſect of a ſcarlet colour within, and without of a blackiſh red; ſometimes of a white reddiſh or aſh-colour, which are accounted the beſt, and are brought us from Mexico. Theſe inſects are uſed both in dying and in medicine.

## THE GNAT AND THE TIPULA.

THE tipula, or long legs, and the larger kind of gnat, have frequently been miſtaken for each other; they are both mounted on long legs, both furniſhed with two wings and a ſlender body: the principal difference is, that the tipula wants a trunk, and the gnat has a large one, which it often exerts to very miſchievous purpoſes; but the tipula is peaceful and innocent. The gnat of Europe, indeed, gives but little uneaſineſs; but it is very different in America, where the waters ſtagnate, and the climate is warm, and where they are produced in multitudes beyond expreſſion. There they are found from ſix inches in length to a minuteneſs that requires even the microſcope to perceive them. Tho' the ſuffering inhabitants deſtroy millions daily, ſtill

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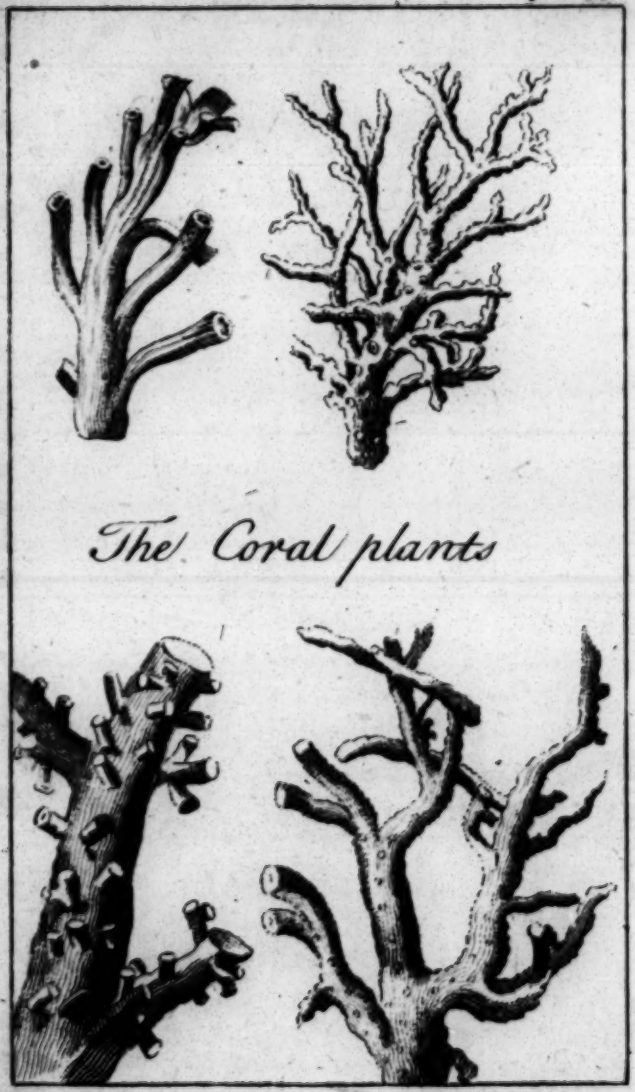

The Coral plants

ſtill millions more ſucceed, and produce unceaſing torment.

## OF WORMS.

ANIMALS of the worm kind are the firſt in the claſs of the zoophytes: being entirely deſtitute of feet, they trail themſelves upon the ground, and find themſelves a retreat under the earth or in the water. Like moſt other inſects, worms have breathing-holes along the back, adjoining each ring, but they are without bones, without eyes, and without ears. Some animals live without their limbs, but the earth-worm, and all the zoophyte tribe, continue to live in ſeparate parts when cut into pieces; and one animal, by the means of cutting, is divided into two diſtinct exiſtencies, and ſometimes into a thouſand. This is the moſt aſtoniſhing phenomenon in all natural hiſtory, that man ſhould have a kind of creative power, and out of one life make two, each completely formed, with all its apparatus and functions. This obtains alſo in the ſea-worm, the water-worm, and in many other of the vermicular ſpecies.

THE

## THE STAR-FISH, THE POLIPUS, THE CORAL PLANTS, AND ALL THE VARIETIES OF THE SEA-NETTLE.

NATURALISTS have given to the worm, and all theſe animals, the name of zoophytes. Theſe are not produced by the ordinary forms of generation, but are propagated by diſſection. Some of theſe, as already obſerved, though cut into an hundred parts, ſtill retain life in each; and are endued with ſuch a vivacious principle, that every part becomes a perfect animal in a very ſhort time. They are a ſet of creatures placed between animals and vegetables, and form the ſhade that connects animal and inſenſible nature. Such are the ſcuttle-fiſh, the ſea-ſtar, the ſea-nettle, and coral plants. Numbers of what ſeem plants at ſea, are not only the receptacles of inſects, but alſo entirely of inſect formation. Hence ſome philoſophers have been led into opinion, that all nature was animated, and that the moſt inert maſs of matter was endued with life and ſenſation, and only wanted organs to make thoſe ſenſations perceptible to the beholder.

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